6901 WEST 63RD STREET, SUITE 407, OVERLAND PARK, KS 66202

TECHLAW INC.

PHONE: (913) 236-0006
FAX: (913) 236-0013

August 16, 2002

DCN: RR7-TLI-07YX-01-HS-0374

Mr. Thomas Lorenz
U.S. Environmental Protection Agency
Region 7
Superfund Division
Federal Facilities and Special Emphasis Branch
901 North 5th Street
Kansas City, Kansas 66101

Re: EPA Contract No.68-W-01-051; EPA Work Assignment No. 07-YX
TechLaw Project No. RR7-K07; St. Louis (ex) Army Ammunition Plant
Health and Safety Plan

Dear Mr. Lorenz:

Enclosed please find TechLaw's Health and Safety Plan for performing split sampling at the St. Louis (ex) Army Ammunition Plant. If you have any questions regarding this submittal, please call me at (913) 236-0006, extension 104 or Steve Bryant at extension 108.

Sincerely,

TechLaw, Inc.

Fred Molloy

Fred Molloy
Senior Project Manager

40271593
Superfund

22.0

Enclosure

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copy: M. LaPierre, TechLaw Deputy Health and Safety Director
P. Brown-Derocher/Central Files
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DCN: RR7-TLI-07YX-01-HS-0374

ST. LOUIS (EX) ARMY AMMUNITION PLANT

HEALTH AND SAFETY PLAN

AUGUST 2002

Submitted to:

U. S. Environmental Protection Agency
Region 7
Superfund Division
Federal Facilities and Special Emphasis Branch
901 North 5th Street
Kansas City, Kansas 66101

Submitted by:

TechLaw, Inc.
6901 West 63rd Street, Suite 407
Overland Park, Kansas 66202

Work Assignment No.:	07-YX
Contract No.:	68-W-01-051
Date Prepared:	August 16, 2002
Prepared By:	TechLaw, Inc. Steve Bryant (913) 236-0006 extension 108
TechLaw Project No.:	RR7-K07
EPA Primary Contact:	Thomas Lorenz
Telephone No.:	(913) 551-7292

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TABLE OF CONTENTS

Tables

Appendices

1.0 Project Description

Under Regional Oversight Contract (ROC) Number 68-W-01-051, TechLaw, Inc. (TechLaw) is currently providing technical assistance to the U.S. Environmental Protection Agency (EPA) Region 7, Superfund Division, Federal Facilities and Special Emphasis Branch. TechLaw has been tasked under Work Assignment Number 07-YX to provide technical oversight support to EPA at the former St. Louis (ex) Army Ammunition Plant (SLAAP) site in St. Louis, Missouri. Oversight support provided by TechLaw at SLAAP consists of observing, documenting, reporting, and conducting soil, sediment, wastewater, and concrete core split sampling. TechLaw personnel will attend daily tailgate safety meetings on each day of split sampling. TechLaw personnel will observe U.S. Army Aviation and Missile Command (AMCOM)/U.S. Army Corps of Engineers (USACE) work zones and follow any site-specific security and health and safety procedures.

The EPA Work Assignment Manager (WAM), Thomas Lorenz, has directed TechLaw to conduct split sampling at SLAAP to verify the quality of sampling and analysis performed by AMCOM/USACE. This document constitutes TechLaw's Health and Safety Plan (HSP) for performing sampling activities at SLAAP.

TechLaw anticipates sampling activities will include the collection of confirmation split soil, water/oil mixtures, and concrete core samples. TechLaw anticipates a total of three sampling events to occur between August 2002 and September 2002, with the total number of sampling events being determined by written direction from the EPA WAM. TechLaw anticipates that the following number of samples will be collected during the course of the project: six soil split samples; six water/oil mixture split samples; and six concrete core split samples. AMCOM/USACE contractor personnel will collect all samples and fill split sample containers provided by TechLaw. Water/oil mixture samples are to be collected by AMCOM/USACE contractor personnel from selected sewer manholes located on-site by lowering sampling equipment from the surface to the desired sampling depths. Concrete core samples are to be collected by AMCOM/USACE contractor personnel from the surface of concrete slabs in select buildings. Subsurface soil sampling will be conducted by AMCOM/USACE contractor personnel throughout the site by the use of direct-push technology or hand auger techniques.

It is anticipated that personnel from TechLaw's Overland Park, Kansas, office will perform all split sampling activities at SLAAP. In the event that additional TechLaw personnel are needed, the TechLaw Deputy Health and Safety Director will be notified, TechLaw Medical Data Sheets for the individuals will be provided in Appendix B, the TechLaw field team staff member(s) will be provided a copy of the HSP, and the TechLaw staff member(s) will abide by the HSP and sign the acceptance sheet provided in Appendix A.

2.0 Site Background

SLAAP is owned by the U.S. Department of the Army and is currently under the command of AMCOM. Currently, eight of the original 17 buildings associated with the 105-mm shell casing production are standing. The eight buildings currently are unoccupied.

The SLAAP site originally encompassed 21 acres of land on the northeast portion of the former Saint Louis Ordnance Plant (SLOP). The site is located at 4800 Goodfellow Boulevard in St. Louis, Missouri. The area occupied by SLAAP was owned by General Electric Company/General Electric Realty Corporation from January 1926 to April 1941. The U.S. Army purchased the land in 1941 from General Electric Realty Corporation for the construction of SLOP, which was completed in 1942. SLOP was a 276-acre, small arms ordnance plant that produced 0.30- and 0.50-caliber munitions. In 1944, the northeast portion of SLOP, specifically 21 acres, was designated as SLAAP and converted from small arms munitions production to 105-mm Howitzer shell production. SLAAP was part of SLOP through 1944. Constructed between 1941 and 1942, Buildings 3, 5, 6, and 9 were used for 0.30-caliber munitions production until 1944.

The 21-acre plant was contract-operated by the Chevrolet Shell Division of General Motors Corporation. The Chevrolet Shell Division initiated the production of shells at the property in December 1944, with an accelerated schedule to produce 800,000 shells per month by June 1945. The conversion included altering Building 3 to produce 105-mm Howitzer shells; converting Building 5 to a headquarters and office building; converting Building 6 to additional office space and laboratory building; and converting Building 9 into an Acetylene Generator Building. In addition, Buildings 1, 2, 4, 7, 7A, 8, 8A, 10, 11, 11A, and 11B were constructed in 1944. These buildings were used for the following purposes:

- Building 1 - Billet Cutting Building;
- Building 2 - Forge Building;
- Building 4 - Air Compressor Building;
- Building 7 - Water Pump House;
- Building 7A - Cooling Tower;
- Building 8 - Fuel Storage Area;
- Building 8A - Oil Pump House;
- Building 10 - Quench Oil Storage Tank;

- Building 11 - Foamite Generator Building; and
- Buildings 11A/11B - Hose Cart Shelters.

In 1985, portions of Buildings 3, 5, and 6 were converted into office space. The production machinery remained on the property until it was removed in 1989. In 1998 these buildings were vacated.

Several environmental investigations including a site-wide Environmental Baseline Survey (EBS) and removal actions have been carried out in the past at SLAAP. These activities are discussed below. The site-wide EBS was conducted in 2000 to determine the environmental condition of the property, prior to transfer, outgrant, or disposal. Tetra Tech EM, Inc. prepared the site-wide EBS for AMCOM.

Underground Storage Tanks (USTs) Investigation and Removal

The site-wide EBS indicated that six USTs were installed and used at SLAAP. The six USTs included three steel quench oil tanks; one concrete sludge pit; and two steel gasoline tanks. The quench oil tanks ranged in capacity from 14,000 to 15,000 gallons; the sludge pit had a volume of approximately 10,000 gallons; and the gasoline tanks had capacities of approximately 6,000 and 11,000 gallons. The quench oil tanks were located east of Building 3 and used to supply oil to the 14 quench tanks used in the production of 105-mm Howitzer shells. The concrete sludge pit was installed next to the quench oil tanks in 1944 and received used quench oil from Building 3. Residue settled out of the used quench oil in the pit before the oil was reused. The 6,000-gallon gasoline UST was used to fuel vehicles and other gasoline-powered equipment at SLAAP with regular (leaded) gasoline. The site-wide EBS stated that in 1969, the contents of the USTs were removed and the quench oil tanks, sludge pit, and 6,000-gallon gasoline tank were filled with water. One additional 10,000-gallon gasoline UST, that had been installed west of Building 2 in 1945, was reportedly abandoned in-place in 1959 by filling with sand. USACE performed an investigation and evaluation of USTs in 1989 at SLAAP.

An investigation of the USTs was also conducted in 1992 by J.D. Chelan in preparation for their removal. The investigation included sampling of the UST contents, installation of 12 soil borings, and collection of subsurface soil samples. Analysis of the UST contents revealed that each quench oil tank contained mostly water, with 1 to 2 percent oil and sludge material. The sludge pit contained water and approximately 5 percent oil and sludge. The 6,000-gallon gasoline tank was filled almost entirely with water, and the 10,000-gallon gasoline tank contained a mixture of 25 percent water and 75 percent coal-like fines. The liquids in the USTs were analyzed and found to contain no polychlorinated biphenyls (PCBs) while the analysis of the solids revealed low concentrations of metals. Total petroleum hydrocarbons (TPH) ranged from 11 to 6,530 parts per million (ppm) in the subsurface soil samples. The highest TPH concentrations were detected in samples collected from 13 to 17 feet below ground surface (bgs) around the quench oil tanks. The sample collected near the 6,000 gallon gasoline tank at 7 feet bgs revealed TPH at a concentration of 491 ppm. The site-wide EBS stated that one surface soil sample collected from a pipe north of the 6,000-gallon gasoline tank contained a red "solvent-like" material. Analysis of the material revealed benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds at a concentration of 477,200 ppm. The pipe led from the gasoline UST to the gasoline dispensing pump and is embedded in the structural concrete foundation.

UST removal activities were conducted in 1992. Prior to the removal, approximately 2,300 gallons of the water and oil mixture was pumped from the tanks and transported to an off-site oil recycling facility. The USTs and 1,500 cubic yards of contaminated soil were removed and subsequently disposed. Confirmation samples collected from the excavation indicated that further remedial action was required. An additional 300 cubic yards of contaminated soil was removed and disposed. Closure of the SLAAP UST sites is pending.

Polychlorinated Biphenyls

Oils containing PCBs were used at SLAAP in machining processes. The site-wide EBS identified that the PCB-containing oil, which was called "soluble oil," was used primarily as a coolant in the milling, lathing, and smoothing processes in Building 3. PCBs were also used in hydraulic oils and transformers found throughout the site. The soluble oil was circulated from the soluble oil and mixing room on the first floor of Building 3 to the machinery on the first and second floors by overhead lines. These lines then fed oil through pipe drops to individual machines.

PCBs were first detected at SLAAP in creosote-treated wood flooring blocks that were removed during Building 3 renovation activities in March 1991. The initial sampling was performed by the General Services Administration (GSA) in April 1991. In May 1991, after additional sampling and analysis of the creosote-treated wood blocks, EPA Region 7 issued a notification of noncompliance (NON) to SLAAP under the authority of the Toxic Substances Control Act (TSCA). From September 1991 through August 1994, Rust Remedial Services, Inc., performed decontamination activities and confirmatory sampling on the first and second floors of Building 3. The corrective action consisted of removal of PCB-contaminated wood blocks, concrete floors, and block walls on the first and second floors of the building. As part of the remedial approach for Building 3, a health-based risk assessment was completed in June 1996 (Woodward Clyde-Consultants) to determine risk-based clean up levels for the basement and the first and second floors of Building 3. The risk assessment conducted by Woodward Clyde-Consultants concluded that the concentrations of contaminants of concern did not present an imminent threat to human health and the environment. The Agency for Toxic Substance and Disease Registry (ATSDR) did not endorse the health-based risk assessment, and the issue of the NON is currently unresolved. EPA will make a final determination upon completion of the risk assessment and remedial activities conducted by the Army.

Pesticides

Soil and surface wipe samples collected in the basement of Building 3 in June 1994 by Dames & Moore contained pesticides, including 4,4-DDE; 4,4-DDD; 4,4-DDT; dieldrin; endrin; heptachlor epoxide; and gamma-BHC. The origin of the pesticides was not identified in the site-wide EBS. The risk assessment, completed by Woodward Clyde-Consultants in June 1996 for PCBs, included the identified pesticides. The risk assessment concluded that pesticides in the basement of Building 3 do not pose an unacceptable risk.

Asbestos-Containing Material (ACM)

An ACM survey was conducted at SLAAP in June and July 1991 by Plant Facilities and Engineering, Inc. (PFE). Corrugated ACM siding was used on Buildings 1, 2, 3, 4, 5, and 6; building crossovers; and the western guard shack. ACM was also found in stock items consisting of packing and gasket material in Building 4 and was identified in the thermal system insulation on abandoned pipelines in Buildings 4A, 7, and the basements of Buildings 3, 5, and 6. The floor tile and mastic in Buildings 3, 5, and 6 contained nonfriable ACM. Both friable and nonfriable ACM were found throughout the buildings at SLAAP. ACM will be addressed under National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations. ACM in Building 3 will be removed prior to demolition of Building 3. The disposition of ACM in other buildings at SLAAP has not been determined.

Lead-Based Paint

In 1993, a Preliminary Assessment (PA) screening was conducted at Building 3 for lead-based paint (LBP) by U.S. Army Environmental Hygiene Agency (USAEHA) because of the age of the building and as a result of previous sampling conducted in April 1992. The screening report cites a potential human health and environmental threat associated with LBP at the site.

Radon

A radon survey was conducted in the basement of Buildings 3, 5, and 6 by PFE from December 1991 to June 1992. Army Regulation 200-1 requires that mitigation be undertaken if the average annual radon concentration in a structure exceeds 4 picoCuries per liter (pCi/L) of air. The investigation report indicated that radon concentrations in the basement of Buildings 3 and 6 did not exceed 4 pCi/L of air. However, the basement of Building 5 had an overall average radon concentration of 5.29 pCi/L.

3.0 Project Personnel and Responsibilities

Specific TechLaw health and safety personnel and functions are defined in this section with project contact information presented in Table 1. At the direction of the EPA WAM, TechLaw has responsibility for the development, review, and approval of the HSP for performing split sampling at SLAAP.

Maxine LaPierre, TechLaw Deputy Health and Safety Director
Maxine LaPierre, TechLaw Deputy Health and Safety Director, will be responsible for reviewing and approving the HSP to ensure that the document meets the requirements under the following Code of Federal Regulations (CFR): 29 CFR 1910.120. Specifically, Ms. LaPierre will be responsible for the following:

- Reviewing, modifying, and developing Health and Safety Program policies and standard operating procedures;
- Directing and monitoring the training program to ensure that the program remains current and all personnel are meeting health and safety training requirements;
- Reviewing the Medical Surveillance Program with the medical consultant, as needed, and maintaining oversight of the program;
- Ensuring that all appropriate project personnel participate in the medical surveillance and training programs;

- Briefing TechLaw management on health and safety issues;
- Investigating significant incidents, HSP violations, accidents, and lost time accidents/illnesses;
- Approving all facility-specific HSPs;
- Overseeing audits of health and safety procedures; and
- Directing liaison activities with EPA, OSHA, and other government agency personnel involved with health and safety issues.

Steve Bryant, TechLaw Site Safety Officer

Steve Bryant, TechLaw Site Safety Officer, will be responsible for ensuring that all field activities are implemented in accordance with the requirements of this HSP. Specific duties include the following:

- Directing all health and safety field activities so that they are consistent with the site-specific HSP;
- Acting as the point-of-contact in the field between TechLaw personnel and the facility safety personnel;
- Directing TechLaw personnel in an emergency;
- Documenting field activities in the daily field log and completing health and safety-related reports, as necessary;
- Investigating all incidents, accidents, illnesses, and injuries occurring at the facility and reporting results to the TechLaw Health and Safety Director;
- Conducting or attending safety briefings and facility-specific training for on-site personnel, if necessary;
- Monitoring all field team members for work fatigue and heat/cold stress as appropriate;
- Directing all decontamination procedures; and
- Stopping work, as required, to ensure personnel safety and protection, and notifying emergency services, as necessary.

TechLaw Field Team Members

At the current time, it is anticipated that TechLaw personnel from the TechLaw Overland Park, Kansas office will undertake all field activities for this project. In the event that additional TechLaw personnel are required, the additional TechLaw field team members must be approved, in advance, by the TechLaw Deputy Health and Safety Director. Each TechLaw field team member will be responsible for adhering to this HSP and signing the HSP acceptance sheet provided in Appendix A.

TechLaw field team members have completed the following training required under 29 CFR 1910.120: 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Training, 8-hour Refresher Training, Supervisor's Training, and participate in the TechLaw medical surveillance program. TechLaw field team members have also been approved for respirator usage as per 29 CFR 1920.134.

Table 1
St. Louis (ex) Army Ammunition Plant
Project Contacts

Project Title	Contact	Address	Phone
TechLaw Site Safety Officer	Steve Bryant	TechLaw, Inc. 6901 West 63rd Street, Suite 407 Overland Park, KS 66202	913/236-0006, ext. 108 (Office) 913/894-9182 (Home)
TechLaw Work Assignment Manager	Steve Bryant	TechLaw, Inc. 6901 West 63rd Street, Suite 407 Overland Park, KS 66202	913/236-0006 (Office) 913/894-9182 (Home)
TechLaw Deputy Health and Safety Director	Maxine LaPierre	TechLaw, Inc. 750 N. Paul Street, Suite 600 Dallas, TX 75201	214/572-0074 (Office) 214/987-4410 (Home)
TechLaw Corporate Physician	Mark Strauss, MD	The Doctors Building 500 South University, Suite 615 Little Rock, AR 72205	501/666-3666 (Office)
EPA Work Assignment Manager	Thomas Lorenz	EPA Region 7 901 North 5th Street Kansas City, KS 66101	913/551-7292
USACE Project Manager	Brad Eaton	USACE 700 Federal Building Kansas City, MO 64106	816/983-3861
Emergency Contacts	Florence Hill Health Center	Florence Hill Health Center 5541 Riverview Boulevard St. Louis, MO Directions and map to hospital provided in Appendix C	911 (Emergency) 314/389-4566 (Hospital) 800/942-5969 (Poison)

4.0 Hazard Assessment

Physical Hazards

TechLaw personnel are to avoid any dangerous areas identified by AMCOM/USACE and their contractors and observe any facility-specific safety precautions required. Physical hazards include overhead and surface obstacles, open manholes and excavations, dust generated by nearby demolition of Building 3, noise, heat stress, and environmental conditions such as lightning storms, hail, tornadoes, rain, as well as slips, trips, and falls. Other hazards could involve proximity to ongoing demolition of Building 3, such as falling demolition debris, traffic, heavy equipment operations, and noise. No unexploded ordnance was historically present on-site.

Chemical Hazards

Site chemical contaminants of concern include organic compounds [principally PCBs and a variety of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), inorganic compounds (metals), and asbestos]. Dioxins are also potentially present in areas where PCB-containing oils may have been exposed to high temperatures. A description of chemical hazards for suspected on-site compounds or compounds detected during previous site investigations is presented in Table 2. In addition, sample containers for low-level VOC in soil sampling contain small amounts (< 5 mL) of sodium bisulfate as a preservative.

Biological/Pathological/Radiological

Biological hazards include insects (ticks, chiggers, spiders) and animals (rodents). Insect repellent will be applied as needed. No radioactive materials are known to exist at the facility site.

Table 2
Chemical Hazards

Chemical Name	OSHA or ACGIH Exposure Limits (TWA unless noted)	Physical Description	Acute Health Hazard Symptoms
Asbestos	0.1 fibers/cm^3	White or greenish (chrysotile), blue (crocidolite), or gray-green (amosite) fibrous, odorless solids.	Asbestosis (chronic exposure): dyspnea, interstitial fibrosis, restricted pulmonary function, finger clubbing; irritation of eyes; potential occupation carcinogen.
Benzene	1 ppm	Colorless to light-yellow liquid with an aromatic odor.	Irritation of eyes, skin, nose, and respiratory system; giddiness; headache; nausea; staggered gait; fatigue; anorexia; lassitude; dermatitis; bone marrow depressant; potential occupational carcinogen.
Ethylbenzene	100 ppm IDLH: 800 ppm	Colorless liquid with an aromatic odor.	Irritation of eyes, skin, and mucous membrane; headache; dermatitis; narcosis; coma.
Tetra-chloroethylene (PCE)	REL: Ca IDLH: [150 ppm]	Colorless liquid with a mild, chloroform-like odor.	Irritation of eyes, nose, throat; nausea; flush face, neck; vertigo, dizziness, incoherence; headache, somnolence; skin erythema; liver damage; potential occupational carcinogen.
Toluene	200 ppm IDLH: 500 ppm	Colorless liquid with a sweet pungent, benzene-like odor.	Irritation of eyes, nose; fatigue, weakness, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation; nervousness, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Trichloroethylene (TCE)	REL: Ca IDLH: [1000 ppm]	Colorless liquid (unless dyed blue) with a chloroform-like odor.	Irritation of eyes. skin; headache, vertigo; visual disturbance, fatigue, giddiness, tremor, somnolence, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; potential occupational carcinogen.
Xylenes	100 ppm IDLH: 900 ppm	Colorless liquid with an aromatic odor	Irritation to eyes, skin, noes, throat; dizziness, excitement, drowsiness, incoherence, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Arsenic (inorganic)	0.01 mg/m^3	Metal: silver-gray or tin-white, brittle, odorless solid.	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyper pigmentation of skin , potential occupational carcinogen.
Chromium (Cr II, Cr III, and metal)	Cr II,III: 0.5 mg/m^3 Metal: 1 mg/m^3 IDLH: 25 mg/m^3 (as CRIII)	Metal: Blue-white to steel-gray lustrous, brittle, hard, odorless solid.	Metal: Irritation of eyes and skin; sensitization dermatitis; lung fibrosis (histologic).
Lead	0.050 mg/m^3 IDLH: 100 mg/m^3	Metal: a heavy, ductile, soft, gray solid.	Weakness, lassitude, insomnia; facial pallor; eye palpitations, anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremors; paralysis of wrist, ankles; encephalopathy; kidney disease; eye irritant; hypotension.

Table 2
Chemical Hazards

Chemical Name	OSHA or ACGIH Exposure Limits (TWA unless noted)	Physical Description	Acute Health Hazard Symptoms
Mercury (organo) alkyl compounds	0.01 mg/m^3 IDLH: 2 mg/m^3	Appearance and odor vary depending upon the specific compound.	Paresthesia; ataxia, dysarthria; vision, hearing disturbance; spasticity, jerking limbs, dizziness; salivation; lacrimation; nausea, vomiting, diarrhea, constipation; skin burns; emotional disturbance; kidney injury; possible teratogenic effects.
Mercury and its compounds (except organo alkyls)	REL: Vapor 0.05 mg/m^3 (skin) IDLH: 10 mg/m^3	Metallic mercury is a shiny-silver liquid metal at room temperature.	Irritation of eyes and skin; cough, chest pain, dyspnea, bronchitis pneumonitis; tremor, insomnia, irritability, indecision, headache, fatigue, weakness; stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria.
Polychlorinated biphenyl (Aroclor 1254)	0.50 mg/m^3 (skin) IDLH: 5 mg/m^3	Colorless to pale-yellow, viscous liquid or solid (below 50°F) with a mild hydrocarbon odor	Eye irritant; chloracne; liver damage; reproductive effects. Carcinogen.
Dioxin (2,3,7,8-Tetrachloro-dibenzo-p-dioxin)	PEL, TLV: None REL: Lowest feasible concentration IDLH: Not yet determined	Colorless to white, crystalline solid.	Eye irritant; allergic dermatitis, chloracne; porphyria; gastrointestinal disturbance; possible reproductive and teratogenic effects; in animals: liver, kidney damage; hemorrhage; potential occupational carcinogen.
Silica - crystalline quartz	0.05 mg/m^3 respirable dust	Colorless, odorless solid	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function, silicosis
Sodium bisulfate (low-level VOC in soil sample preservative)	No listed PEL/TLV/REL/IDLH	Colorless, odorless, solid.	Causes eye and skin burns; causes gastrointestinal tract burns and may cause severe and permanent damage to digestive tract; respiratory tract irritant; burning pain in nose and throat, coughing, wheezing, shortness of breath and pulmonary edema; chemical burns to the respiratory tract; nausea, vomiting, headache.

TLV: Threshold Limit Value
IDLH: Immediately Dangerous to Life and Health
REL: NIOSH Recommended Exposure Limit
STEL: Short-Term Exposure Limit

5.0 Personal Protection

Physical Hazards

Existing personal protective equipment (PPE) for physical hazards used at SLAAP includes Level D (hardhat, steel-toe/shank safety boots, safety glasses) for the entire site. In addition, AMCOM/USACE or their contractor maintains first aid, fire extinguishers and a site evacuation plan for site emergencies. TechLaw personnel will wear Level D (hardhat, steel-toe/shank safety boots, safety glasses), including a long-sleeved shirt in all areas of the site and will wear hearing protection when observing heavy equipment operations. In addition, Level C PPE (Level D plus Tyvek® coveralls, latex boot covers, and air-purifying respirator with GME/P-100 cartridges) will be worn as needed in proximity of concrete coring.

The TechLaw Site Safety Officer will monitor each field member for heat stress and fatigue throughout the inspection and sampling event. In addition, all TechLaw field team members will monitor each other for heat stress, including the following symptoms:

- Fatigue, nausea, and giddiness;
- Red shaded skin;
- Dehydration;
- Moist, clammy, and pale skin; and
- Signs of possible fainting.

If any member of the TechLaw field team exhibits any of the above symptoms, they must be removed to a cool environment and given cool water or other beverages as necessary until they recover. If the individual loses consciousness, medical assistance should be obtained immediately. All TechLaw field team members will take frequent rest breaks in a shaded area as appropriate for the conditions to prevent overheating. Fluids such as water and Gatorade will be available in the support zone for TechLaw field team members throughout all field operations.

TechLaw personnel will enter exclusion zones as needed to observe AMCOM/USACE contractor soil, water/oil mixtures, and concrete core sampling activities. Exclusion zone locations are to be designated by the AMCOM/USACE contractor. If necessary, as determined by the AMCOM/USACE contractor, TechLaw personnel will undergo the site safety training provided by the AMCOM/USACE contractor to become familiar with the site evacuation plan and the location of site fire extinguishers. TechLaw personnel will also become familiar with directions to the nearest hospital provided in Appendix C.

Chemical Hazards
Existing facility PPE for chemical hazards at SLAAP includes Level D plus Tyvek® coveralls and disposable boot covers. No special or modified PPE is required at SLAAP, except in areas of asbestos removal in the basement of Building which require Level C PPE. It is not anticipated that this area will be entered because the asbestos removal area is not part of the site-specific EBS. Air-supplied respiratory protection devices are not required for routine exposures or as an escape device at SLAAP, and there are no areas at SLAAP which are oxygen-deficient or are classified as immediately dangerous to life or health (IDLH). TechLaw field team members will not enter any confined spaces present at the site

TechLaw personnel will wear Level D plus Tyvek® coveralls, latex boot covers, and nitrile gloves when performing all sampling activities. In addition, TechLaw personnel will abide by the Material Safety Data Sheets (MSDSs) provided in Appendix E for sample preservatives.

Since volatile organic chemical contaminants are a concern at SLAAP, TechLaw will obtain air monitoring data from the AMCOM/USACE contractor as necessary during field activities. However, no air monitoring will be undertaken by TechLaw. In addition, each TechLaw Field Team Member will maintain a full-face respirator with MSA brand GMC-H or GME/P-100 cartridges in the event that emergency situations warrant respiratory protection.

Biological/Pathological/Radiological Hazards
TechLaw personnel will wear Level D , including long-sleeved shirt, in all areas of the site, to reduce exposure to biological hazards. In addition, TechLaw personnel will avoid high grass/brush areas, will check skin and clothing for ticks when exiting wooded areas, and will become familiar with the symptoms of Lyme disease (see Appendix F).

Equipment List
Each TechLaw Field Team Member will be responsible for maintaining the following equipment while on-site at SLAAP:

- Hardhat;
- Steel-toe/shank safety boots;
- Safety glasses;
- Hearing protection;
- Tyvek® coveralls;
- Nitrile gloves;
- Long-sleeved shirt;
- Latex boot covers;

- Full-face respirator; and
- GMC-H or GME/P-100 respirator cartridges.

6.0 Decontamination and Waste Management

If necessary, TechLaw field team members will undertake personal decontamination according to TechLaw Standard Operating Procedure (SOP) No. 09-08-01 (Appendix D). Used PPE will include Tyvek® disposable coveralls, disposable nitrile sampling gloves, disposable latex boot covers, and paper towels. TechLaw will accumulate all used PPE in a plastic trash bag for subsequent transport to the designated AMCOM/USACE PPE accumulation point. TechLaw will notify the EPA WAM for subsequent notification to AMCOM/USACE when the transport of PPE is to be undertaken.

Because TechLaw will only be collecting split samples, it is unlikely that decontamination of sampling equipment will be necessary. However, if sampling equipment decontamination is necessary, it will be undertaken according to TechLaw SOP No. 02-03-01 (Appendix D) using an Alconox® soap wash, a potable water rinse, and a de-ionized water rinse. All decontamination solutions will be collected in a five-gallon plastic bucket for transport to the on-site AMCOM/USACE decontamination pad. TechLaw will notify the EPA WAM for subsequent notification to AMCOM/USACE when the transport of the decontamination water is to be undertaken.

APPENDIX A

HEALTH AND SAFETY PLAN
SIGNATURE SHEETS

ST. LOUIS (EX) ARMY AMMUNITION PLANT

HEALTH AND SAFETY PLAN

AUGUST 2002

HEALTH AND SAFETY PLAN APPROVALS

Maxine LaPierre 8/14/02

Maxine LaPierre, TechLaw Deputy Health and Safety Director **Date**

8/16/02

Steve Bryant, TechLaw Site Health and Safety Officer **Date**

TECHLAW FIELD TEAM MEMBERS

I have read and understand the contents of this Health and Safety Plan. I have also been briefed on its contents by the TechLaw Site Health and Safety Officer. I agree to abide by its contents and to follow the directions of the Site Health and Safety Officer.

[signature] 8/16/02

TechLaw Field Team Member Date

TechLaw Field Team Member Date

TechLaw Field Team Member Date

TechLaw Field Team Member Date

APPENDIX B

TECHLAW MEDICAL DATA SHEETS

ST. LOUIS (EX) ARMY AMMUNITION PLANT

HEALTH AND SAFETY PLAN

AUGUST 2002

MEDICAL DATA SHEET

This Medical Data Sheet is completed by all TechLaw field team members performing onsite sampling at SLAAP. This sheet will be kept onsite by the TechLaw Site Safety Officer and will accompany TechLaw personnel when medical assistance is required or if transport to hospital facilities is required. This Medical Data Sheet does not substitute for medical surveillance required by the TechLaw Health and Safety Program for Hazardous Waste Sites.

Project: St. Louis (ex) Army Ammunition Plant, St. Louis, Missouri

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Name: Steve Bryant **Age:** 38 **Height:** 5'9" **Weight:** 160 lbs.

Home Phone: 913/894-9182

Home Address: 15322 W. 83rd Street
Lenexa, Kansas 66219

Who To Contact In Emergency: Sandrea Bryant

Home Phone: 913/894-9182

Work Phone: 913/491-0056

Home Address: 15322 W. 83rd Street
Lenexa, Kansas 66219

Medications Taken Regularly: None

Particular Sensitivities: None

Name of Personal Physician: None

Telephone of Personal Physician: None

MEDICAL DATA SHEET

This Medical Data Sheet is completed by all TechLaw field team members performing onsite sampling at SLAAP. This sheet will be kept onsite by the TechLaw Site Safety Officer and will accompany TechLaw personnel when medical assistance is required or if transport to hospital facilities is required. This Medical Data Sheet does not substitute for medical surveillance required by the TechLaw Health and Safety Program for Hazardous Waste Sites.

Project: St. Louis (ex) Army Ammunition Plant, St. Louis, Missouri

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Name: Keith Slider **Age:** 31 **Height:** 6'1" **Weight:** 172 lbs.

Home Phone: 816/318-3607

Home Address: 802 Canter Drive
Raymore, Missouri 64083

Who To Contact In Emergency: Aundrea Slider

Home Phone: 816/318-3607

Work Phone: 816/257-4573

Home Address: 802 Canter Drive
Raymore, Missouri 64083

Medications Taken Regularly: None

Particular Sensitivities: None

Name of Personal Physician: None

Telephone of Personal Physician: None

APPENDIX C

DIRECTIONS TO NEAREST HOSPITAL

ST. LOUIS (EX) ARMY AMMUNITION PLANT

HEALTH AND SAFETY PLAN

AUGUST 2002

Directions to Nearest Hospital (See Attached Map)

The nearest hospital, Florence Hill Health Center, is located at 5541 Riverview Boulevard, St. Louis, Missouri (Ph. 314/389-4566). Directions to the hospital are as follows: Leave the SLAAP site and turn north on Riverview Boulevard. Drive on Riverview Boulevard north approximately 1/4 to ½ mile. Florence Hill Health Center is located on the east side of Riverview Boulevard.

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MAP RESULTS

Florence Hill Health Center
5541 Riverview Boulevard, Saint Louis, MO 63120
(314) 389-4566
map | driving directions
Information File

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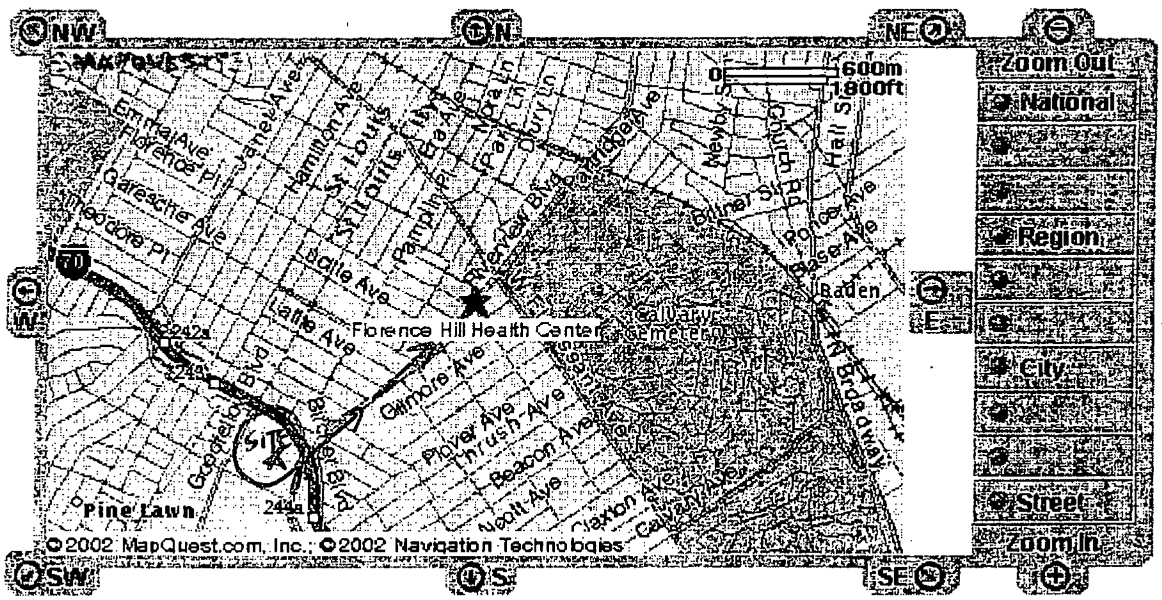
Hospitals, Physicians & Surgeons Clinics



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APPENDIX D

TECHLAW
STANDARD OPERATING PROCEDURES

ST. LOUIS (EX) ARMY AMMUNITION PLANT

HEALTH AND SAFETY PLAN

AUGUST 2002

Technical Approval: David M. Walker Date: 8/19/99

QA Management Approval: John W Goode Date: 8/26/99

SOP Description

This Standard Operating Procedure (SOP) establishes the procedures to be used by TechLaw staff when decontaminating and cleaning sampling equipment in the field. This SOP supports field work associated with government and commercial clients. Although these procedures are applicable to most situations encountered in the field, special situations may arise where deviations may be necessary. In either case, the specific decontamination and cleaning procedure must be outlined in the site-specific sampling and analysis plan (SAP) and/or quality assurance project plan (QAPjP). Changes due to emergency or unforeseen situations arising in the field should be thoroughly documented in the field logbook and approved by the field team leader.

General Procedures

Related SOPs

This SOP is to be used in conjunction with the other relevant and applicable SOPs found in the following SOP categories:

Section No.	Section Title
01	General Procedures
02	Field Procedures
03	Field Documentation Procedures
04	Packaging and Shipping Procedures
05	Field Equipment Operation and Maintenance Procedures
06	Groundwater Sampling/Monitoring and Analysis Procedures
07	Soil/Sediment Sampling and Analysis Procedures
08	Surface Water Sampling and Analysis Procedures
09	Health and Safety Procedures
11	Quality Assurance Procedures
12	Incineration/BIF Sampling and Analysis Procedures
13	Waste Sampling and Analysis Procedures

Equipment and Apparatus

- Dish pans and/or wash tubs
- Scrub brushes
- Phosphate-free laboratory detergent (e.g., Liqui-Nox®)
- Solvent and/or acid rinse solutions (as required)
- Plastic sheeting
- Metal racks and/or sawhorses (as needed for large equipment)
- Drums or other receptacles (for wash/rinse wastewaters and used plastic sheeting)
- Squeeze bottles and/or pump sprayers
- Aluminum foil

General Requirements

Decontamination Procedure Selection

The specific decontamination procedure required for a project depends upon several factors.

- **The EPA Region in which the Project Is Being Conducted** - This is the first consideration in selecting the proper decontamination procedure. Some regions (e.g., EPA Regions IV and V) require more strict decontamination procedures than other regions (e.g., EPA Regions I and VI). The decontamination procedure for any TechLaw project must be selected with this in mind. If no specific decontamination procedure is required by the Agency or commercial client for the region in which the project is being conducted, then the TechLaw basic decontamination procedure described in this SOP will be sufficient. However, if a more stringent procedure is required, it must be included in the project site-specific SAP and/or QAPjP.

- **The Level of Data Quality Required** - The level of data quality required for successful completion of the project is the second consideration in selecting the proper decontamination procedure. All sampling and field equipment must be cleaned in accordance with the procedure which meets the minimum requirements established for the Data Quality Objectives (DQOs) for the project. DQOs are qualitative and quantitative statements which specify the quality of data required to support decisions based on the intended use of the data. DQOs provide information on the limits of the data, which in turn, dictate the proper uses of the data. DQO levels are numbered I through V, with I being the lowest and IV the highest quality data. Level V data are collected using special or non-standard methods. For example, DQO Level I includes samples collected for field screening properties (e.g., pH, specific conductance, and temperature). The TechLaw basic decontamination procedure presented in this SOP is suitable for achieving this level of data quality. In contrast, DQO Level IV includes samples collected for trace organic and metals analyses. The decontamination procedure required for this level of data quality may encompass one of the EPA regional procedures listed in later sections of this SOP. Higher quality methods may be substituted for lower level work.

- **The Nature of the Project** - The third consideration in selecting the proper decontamination procedure is the nature of the project (e.g., full-scale investigation versus oversight activities). Large-scale projects involving intensive sampling by TechLaw personnel will usually require the use of a stringent decontamination procedure. In a situation such as this, the sampling team is responsible for supplying and decontaminating the sampling equipment. However, in oversight situations where EH&S personnel are only responsible for the collection of split samples, the required decontamination procedure may be minimal, and may be the same as the facility's contractor, or none at all. A decontamination procedure usually is limited for oversight projects since the facility's contractor is responsible for providing the sampling and decontamination equipment.

Equipment and Apparatus

A sufficient quantity of clean equipment should be transported to the field so that an entire study can be conducted without the need for field cleaning. However, this is not always possible for some specialized items of field equipment (e.g., portable power augers, drilling rigs, and other large pieces of equipment). In addition, it may not be practical or possible to transport to the field all of the necessary pre-cleaned field equipment required for large-scale investigations. Consequently, the procedure for cleaning and decontaminating the sampling equipment must be determined prior to beginning work in the field. The methods for cleaning sampling equipment in the field must be described in detail in each project SAP and/or QAPjP. The standard procedures (i.e., TechLaw as well as EPA region-specific) for cleaning this equipment in the field are contained in this SOP.

The Use of Solvents

As a general rule, it is preferable to keep the decontamination procedure as simple as possible. The use of solvents (e.g., pesticide-grade acetone, methanol, isopropanol, and hexane) and acid rinses (e.g., hydrochloric and nitric acid) should be discouraged, if at all possible. Solvents and acid rinses should be avoided because they are messy to use in the field and are at risk of being spilled. Furthermore, they are considered by the Department of Transportation (DOT) as hazardous material and must be shipped to, and from, the field as hazardous material/dangerous good subject to the DOT and UN ICAO/IATA regulations. See SOP Nos. 04-04-XX and 04-05-XX for further details regarding the packaging and shipping of hazardous materials/dangerous goods. Finally, the spent materials may be determined to be hazardous wastes, which require manifesting and off-site shipment to a treatment, storage, or disposal (TSD) facility. See SOP No. 02-04-XX for Management of Investigation Derived Waste. Consequently, the use of solvents and acid rinses should be avoided unless specifically required by EPA or other regulatory agencies.

If solvents must be used in the field, only the smallest volume required to complete the field activities should be used to minimize the volume of solvents to be disposed. Solvents should be selected based upon the project analytical parameters of interest and risk. For example, acetone should not be selected as a decontamination solvent if it is one of the analytical constituents of concern. Methanol is more toxic than either isopropanol or acetone and should be avoided. Furthermore, hexane and petroleum ether are not miscible with water which limit their use as rinsing agents. Although hexane is frequently used to remove contaminants from sampling equipment which are not easily removed by other solvents, it is preferable to avoid using hexane and replace the contaminated equipment with new equipment.

Sample Containers

Sample containers do not need to be cleaned in the field as they will be purchased pre-cleaned and certified from the analytical support laboratory or an independent container supplier (e.g., I-Chem or Eagle Picher).

Use of Phosphate-Free Laboratory Detergent

The detergent used in the field should consist of a standard brand of phosphate-free laboratory detergent such as Liqui-Nox®. The use of other detergents such as a commercial phosphate-free dishwashing or laundry detergent is discouraged. Those detergents may only be used if they are clearly specified and approved in the SAP, and documented in the field logbooks and any reports produced.

Water Source

Tap water may be obtained from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute for tap water. Water shall not be used to decontaminate field equipment unless the source of the water is known.

Deionized (DI) water is defined as tap water that has been treated by passing through a standard deionizing resin column. The DI water should contain no heavy metals or other inorganic compounds (i.e., at or above analytical detection limits). Laboratory grade DI water is suitable for these purposes.

Organic-free water is defined as tap water that has been treated with activated carbon and deionizing units. Laboratory DI water does not qualify as an organic-free water substitute; however, commercial HPLC-grade water is usually acceptable provided the supplier has performed analysis on the water and can provide the certificates of analysis. Organic-free water should contain no pesticides, herbicides, extractable organic compounds, and less than 5 $\mu g/\ell$ of purgeable organic compounds. During cleaning operations, the substitution of a higher grade water (i.e., DI or organic-free water for tap water) is permitted and need not be noted in the field logbook as a variation of this SOP. The substitution of a lower grade water is not permitted.

Post-Sampling Requirements

Prior to departing the field at the conclusion of the sampling activities, all sampling equipment should be cleaned on site after final use, unless circumstances prohibit. The date of decontamination must be clearly marked on the equipment (usually on wrapping materials or tags attached to the equipment), along with information stating whether solvent and/or acid rinses were used.

All spent solvents, acid rinse solutions, detergent washwaters, and rinse waters used to clean equipment shall not be reused, unless specifically permitted in the SAP. Advance arrangements should be made for disposal of all cleaning wastes. If an operating waste water treatment plant is present at the facility, decontamination solutions may be disposed of in the plant influent with permission of the facility. Permission may also be requested to dispose of solvents and acid rinse solutions into the facility's laboratory waste containers. Regardless of the method of disposal, permission should be obtained from the facility prior to arriving on site.

If a disposal system is not available locally or if permission to use on-site facilities cannot be obtained, containerize the solutions for later shipment and obtain a sample of each container for laboratory analysis. The containers must be secured so they may be stored until the analytical results are available. Arrangements for disposal should be made prior to departing the facility, if at all possible. Refer to SOP No. 02-04-XX for further information regarding the management and disposal of investigation-derived wastes.

<u>Sampling Equipment Cleaning Procedures</u>

The recommended TechLaw basic decontamination procedure is listed below. At a minimum, this procedure should be followed for all investigatory activities at hazardous waste sites. In several EPA regions, more stringent decontamination procedures are required where Level IV DQOs are specified. For regions where standard operating decontamination procedures exist or where typical decontamination procedures are known, they are listed. Also, a preferred decontamination procedure is listed for the EPA regions where standard operating and/or typical decontamination procedures are not available. The TechLaw basic decontamination procedure should be used under <u>all</u> circumstances except where a more stringent procedure is required by EPA, state, or other regulatory agencies.

- Upon arriving at the site, establish an equipment decontamination area. Refer to Attachment A for a typical decontamination area layout. This area should be upwind and away from sources that might contaminate the cleaned equipment. If a decontamination pad has been constructed for the investigation, conduct the decontamination activities over the pad.

- Cover the working surface with large plastic (polyethylene) sheets. Establish separate areas for contaminated equipment storage, contaminated equipment wash, equipment rinse (including solvent rinses if required), equipment drying, clean equipment storage, cleaning supplies storage, and contaminated wash and solvent solution storage.

- Place dish pans and/or wash tubs on the plastic sheets in the required wash and rinse sequence. Fill the first wash tub with a phosphate-free detergent (e.g., Liqui-Nox®) and tap water solution for washing contaminated equipment. The remaining dish pans and/or wash tubs should remain empty; these pans are used for collecting rinse solutions.

- Fill the squeeze bottles and/or pump sprayers with the tap water and deionized water rinse solutions. If solvents, acid rinses, and organic-free water rinses are required by the regulatory agencies, fill the squeeze/sprayer bottles with these solutions.[1] Place each rinse solution (e.g., tap water, deionized water, solvent, acid rinse) in a separate container; never mix uncontaminated rinse solutions in the same container. Hold the squeeze bottles or pump sprayers over the dish pans/wash tubs while pouring the solutions to collect any spillage which may occur during the process.

- Put on clean gloves and begin decontaminating the equipment.

- Wash the contaminated equipment in the first wash tub filled with a phosphate-free detergent (e.g., Liqui-Nox®) and tap water solution, using scrub brushes, if necessary, to remove particulate matter and surface films. The detergent solution should be replaced when it becomes visibly contaminated and fails to effectively clean the equipment.

- Rinse the equipment thoroughly over the second wash tub with tap water. The water may be dispensed from the squeeze bottles or pump sprayers.

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1 Several EPA regions require that solvents, acid rinses, deionized water, and organic-free water be dispensed from non-interfering glass, Teflon®, or stainless steel containers; plastic containers are usually not approved for these solutions. If these solutions must be used in the decontamination sequence, refer to the specific requirements for the EPA region in which the work is being conducted.

- Rinse the equipment thoroughly over the third wash tub with deionized water. If preferred, the deionized water rinse can also be conducted over the second wash tub since water is used as the rinsing agent in both cases.

- Place the decontaminated equipment on clean plastic sheeting and allow it to completely air dry.

- Wrap the equipment with aluminum foil or clean plastic, if appropriate, to prevent contamination of the equipment if it is going to be stored or transported.

- Clean small equipment (e.g., sampling dishes/pans, stainless steel spoons, split-spoon samplers, and shelby tubes) by submerging the equipment directly into the detergent-filled wash tub. Clean large equipment (e.g., power augers, drill rods, drill bits, and auger flights) by supporting the equipment on metal racks and/or sawhorses over the decontamination pad or plastic sheeting.

- Dispose of all spent decontamination solutions into the facility wastewater treatment system influent, or containerize the solutions into drums or other receptacles for later disposal. If the solutions are containerized, collect a sample of each solution for waste characterization. Secure the containers so they may be stored until the analytical results are available. If possible, finalize disposal arrangements prior to leaving the site. Refer to SOP No. 02-04-XX for further information regarding the management and disposal of investigation-derived wastes.

- Dispose of the used plastic sheeting by placing it into a drum or other receptacle for later disposal.

- Store all cleaned field and sample equipment in a contaminant-free environment.

EPA Regional Decontamination Variations

The cleaning and decontamination procedure selected for use in the field should contain as few steps as possible to acquire agency approval. The use of solvents in the field should be discouraged at all times if possible. In all cases, the above-listed basic decontamination procedure should be used. However, many EPA regions require that a more stringent and specific decontamination procedure be followed for investigations conducted in their specific regions. Furthermore, EPA usually requires that a more stringent decontamination procedure be followed when Level IV DQOs are required.

This section of the SOP contains the known Level IV DQO decontamination procedures required or accepted by the various EPA regions. In regions where a published and approved decontamination procedure exists, the region-specific SOP is listed. For regions which do not have established standard decontamination procedures, a typical or preferred procedure is listed. Typical procedures are those observed by TechLaw personnel to be generally accepted by EPA in that specific region. Preferred procedures are listed where the typical procedures are not known, or were not published. The preferred procedures were derived from existing EPA guidance documents.

EPA Region I:

Preferred Procedure: Region I has no known published standard operating procedure. If Level IV DQO decontamination is required, the following procedure may be followed.

For organics:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Pesticide-grade hexane or methanol* rinse;
- Reagent-grade acetone* rinse;
- Organic-free reagent water rinse; and
- Air dry.

  * Isopropanol may be substituted as the solvent if hexane, methanol, or acetone are constituents of interest.

For inorganics:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Dilute hydrochloric or nitric acid rinse;
- Reagent water rinse; and
- Air dry.

Source: U.S. Environmental Protection Agency, RCRA Ground-Water Monitoring: Draft Technical Guidance, EPA/530-R-93-001, November, 1992.

EPA Region II:

State of New York Standard Operating Procedure:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- 10 percent ultrapure nitric acid* rinse;
- Tap water rinse;
- Methanol** rinse;
- Acetone** rinse;
- Methanol** rinse;
- Deionized water (analyte-free) rinse; and
- Air dry.

  * The nitric acid rinse may be omitted if metals are not analyzed.
  ** The methanol-acetone-methanol sequence may be substituted with isopropanol-hexane-isopropanol if acetone is a constituent of concern.

Source: New York State Department of Environmental Conservation, Division of Hazardous Substances Regulation, RCRA Quality Assurance Project Plan Guidance, Appendix E, 1991.

EPA Region II Standard Operating Procedure:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- 10 percent ultrapure nitric acid* rinse;
- Tap water rinse;
- Acetone only, or methanol followed by hexane** rinse;
- Analyte free water rinse; and
- Air dry.

  * The nitric acid rinse may be omitted if metals are not analyzed.
  ** The solvent rinse may be omitted if volatile organics are not analyzed.

Source: U.S. Environmental Protection Agency, Region II CERCLA Quality Assurance Manual, U.S. EPA Region II Environmental Services Division, Revision No. 1, October 1989.

EPA Region III:

Typical Procedure: Region III has no known published standard operating procedure. If Level IV DQO decontamination is required, the following procedure may be followed.

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Deionized water rinse;
- Pesticide-grade solvent* rinse;
- Deionized water rinse; and
- Air dry.

  * Nitric acid should be used for metals analysis; acetone, methanol, or hexane should be used for organics analysis.

Source: TechLaw experience in EPA Region III, and approved Region III RFI Work Plans.

EPA Region IV:

Standard Operating Procedure:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Deionized water rinse;
- Double rinse with pesticide-grade isopropanol*;
- Organic-free water** rinse; and
- Air dry.

* The standard cleaning solvent is isopropanol; other solvents (e.g., acetone or methanol) may be substituted as site conditions warrant.

** Organic-free water is defined by EPA Region IV as tap water that has been treated with activated carbon and deionizing units, and contains no pesticides, herbicides, extractable organic compounds, and less than 5 $\mu g/\ell$ of purgeable organic compounds as measured by a low-level GC/MS scan.

Source: U.S. Environmental Protection Agency, Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual (ECBSOPQAM), U.S. EPA Region IV, Environmental Services Division, Atlanta, GA, February 1, 1991.

EPA Region V:

Typical Procedure: Region V has no published standard operating procedure. If Level IV DQO decontamination is required, the following procedure may be followed.

For all analyses except metals only:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Hydrochloric or nitric acid* rinse;
- Deionized water rinse;
- Pesticide grade methanol or isopropanol rinse;
- Organic-free water rinse; and
- Air dry.

* The acid rinse may be omitted if metals are not analyzed.

For metals only analyses:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Hydrochloric or nitric acid rinse;
- Reagent water rinse; and
- Air dry.

Source: TechLaw experience in EPA Region V, and approved Region V RFI Work Plans.

EPA Region VI:

Standard Operating Procedure:

For organics:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Distilled water rinse;
- Pesticide-grade hexane or methanol solvent* rinse; and
- Air dry.

* EPA Region VI prefers that solvents not be used for equipment decontamination. Although this step is usually omitted, it may be required at the discretion of the EPA WAM.

For inorganics:

- Phosphate-free laboratory detergent wash;
- Dilute hydrochloric or nitric acid* rinse;
- Tap water rinse;
- Type II reagent grade water rinse; and
- Air dry.

* EPA Region VI prefers that acid rinses not be used during equipment decontamination. Although this step is usually omitted, it may be required at the discretion of the EPA WAM.

Source: U.S. Environmental Protection Agency, RCRA Sampling Procedures Handbook, U.S. EPA Region VI Office of Waste Programs and Enforcement, April 1991.

EPA Region VII:

Preferred Procedure: Region VII has no known published standard operating procedure. If Level IV DQO decontamination is required, the following procedure may be followed.

For organics:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Pesticide-grade hexane or methanol* rinse;
- Reagent-grade acetone* rinse;
- Organic-free reagent water rinse; and
- Air dry.

  * Isopropanol may be substituted as the solvent if hexane, methanol, or acetone are constituents of interest.

For inorganics:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Dilute hydrochloric or nitric acid rinse;
- Reagent water rinse; and
- Air dry.

Source: U.S. Environmental Protection Agency, RCRA Ground-Water Monitoring: Draft Technical Guidance, EPA/530-R-93-001, November, 1992.

EPA Region VIII:

Preferred Procedure: Region VIII has no known published standard operating procedure. If Level IV DQO decontamination is required, the following procedure may be followed.

For organics:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Pesticide-grade hexane or methanol* rinse;
- Reagent-grade acetone* rinse;
- Organic-free reagent water rinse; and
- Air dry.

  * Isopropanol may be substituted as the solvent if hexane, methanol, or acetone are constituents of interest.

For inorganics:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Dilute hydrochloric or nitric acid rinse;
- Reagent water rinse; and
- Air dry.

Source: U.S. Environmental Protection Agency, RCRA Ground-Water Monitoring: Draft Technical Guidance, EPA/530-R-93-001, November, 1992.

EPA Region IX:

Standard Operating Procedure:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Dilute nitric acid rinse*;
- Deionized/distilled water rinse;
- Pesticide-grade solvent** rinse;
- Double rinse with deionized/distilled water;
- Organic-free water rinse (HPLC grade).

* Nitric acid may, or may not be required per the discretion of the EPA WAM.

** Acetone is not recommended if it is a constituent of concern.

Source: U.S. Environmental Protection Agency, Preparation of a U.S. EPA Region 9 Sample Plan, November 1987.

EPA Region X:

Preferred Procedure: Region X has no known published standard operating procedure. If Level IV DQO decontamination is required, the following procedure may be followed.

For organics:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Pesticide-grade hexane or methanol* rinse;
- Reagent-grade acetone* rinse;
- Organic-free reagent water rinse; and
- Air dry.

* Isopropanol may be substituted as the solvent if hexane, methanol, or acetone are constituents of interest.

For inorganics:

- Phosphate-free laboratory detergent wash;
- Tap water rinse;
- Dilute hydrochloric or nitric acid rinse;
- Reagent water rinse; and
- Air dry.

Source: U.S. Environmental Protection Agency, RCRA Ground-Water Monitoring: Draft Technical Guidance, EPA/530-R-93-001, November, 1992.

Health and Safety

Some of the materials used to implement the cleaning procedures outlined in this SOP can be dangerous if improperly handled. Due caution must be exercised by all personnel and all applicable safety procedures shall be followed. At a minimum, the following precautions shall be taken during cleaning operations:

- Safety glasses with splash shields or goggles and chemical resistant gloves are to be worn during all cleaning operations;
- All solvent rinsing operations are to be conducted under a fume hood or in the open (never in a closed room); and
- No eating, smoking, drinking, chewing, or any hand-to-mouth contact is permitted during cleaning operations.

It is TechLaw's policy to maintain an effective program for control of employee exposure to chemical, radiological, and physical stress which is consistent with OSHA and other applicable and appropriate established standards and requirements.

All field personnel will be provided with appropriate personal protective clothing and safety equipment. At a minimum, this will include a hardhat, hearing protection, full-face respirator, steel-toed safety shoes, and safety glasses. Personnel are required to inspect their PPE prior to entering any job site and replace any damaged items.

A site-specific health and safety checklist/plan must be developed by the field team leader or designee and approved by the HSD prior to implementation in the field. This checklist/plan must be reviewed with the TechLaw field team members prior to beginning work.

Any deviation(s) from an approved site-specific health and safety checklist/plan must be documented in the field logbook.

QA/QC

The effectiveness of the equipment cleaning procedure used shall be monitored by rinsing cleaned equipment (equipment used to collect samples) with organic-free or DI water and submitting the rinse water for low-level analysis of extractable organic compounds including pesticides and a standard ICP scan for metals. At least one such sample shall be collected from each piece of equipment used. Depending upon the procedures in the SAP, more samples may be taken. All such samples may not be analyzed, but should be available in case contamination is suspected. Normally the QC samples analyzed will not exceed 5 to 10 percent of the total samples taken.

Samples of all rinse materials shall be taken in the field. Any time a new source of cleaning materials or rinse water is used, a sample of that cleaning material or rinse water shall also be taken.

Comments/Notes

None at this time.

Attachments

Attachment A - Decontamination Area Layout

References

TechLaw Inc., Health and Safety Program, 1999.

TechLaw Inc., Quality Assurance Program Plan (as amended for the RCRA Enforcement, Permitting and Assistance Contract).

New York State Department of Environmental Conservation, Division of Hazardous Substances Regulation, RCRA Quality Assurance Project Plan Guidance, Appendix E, 1991.

U.S. Environmental Protection Agency, Region II CERCLA Quality Assurance Manual, U.S. EPA Region II Environmental Services Division, Revision No. 1, October 1989.

U.S. Environmental Protection Agency, A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001, Washington, D.C., 1987.

U.S. Environmental Protection Agency, Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual (ECBSOPQAM), U.S. EPA Region IV, Environmental Services Division, Atlanta, GA, February 1, 1991.

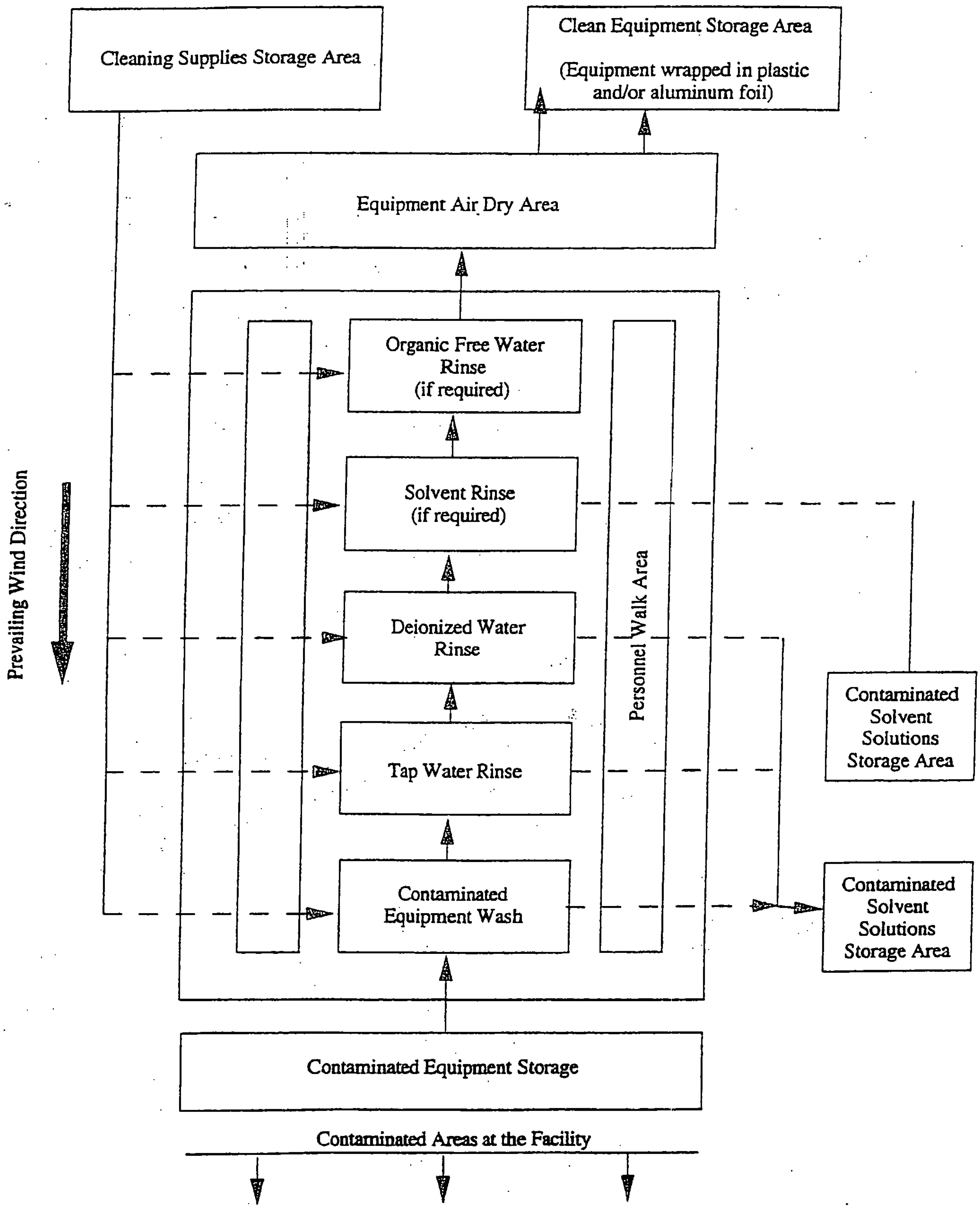
U.S. Environmental Protection Agency, Preparation of a U.S. EPA Region 9 Sample Plan, November 1987.

U.S. Environmental Protection Agency, RCRA Ground-Water Monitoring: Draft Technical Guidance, EPA/530-R-93-001, November, 1992.

U.S. Environmental Protection Agency, RCRA Sampling Procedures Handbook, U.S. EPA Region VI Office of Waste Programs and Enforcement, April 1991.

Attachment A
SOP Number: 02-03-01

Decontamination area layout



Technical Approval: David M. Walker Date: 6/21/99

QA Management Approval: John W Goode Date: 7/2/99

SOP Description

This Standard Operating Procedure (SOP) establishes the procedures for the operation of the TechLaw Personal Protective Equipment (PPE) program. The objective of the SOP is to describe the proper use and maintenance of PPE.

This SOP applies to field activities where personnel may be exposed to hazardous materials/wastes. Field activities include any activities requiring either a health and safety plan (HASP) or a health and safety evaluation checklist (HSEC).

General Procedures

Related SOPs

This SOP is to be used in conjunction with the other relevant or applicable SOPs found in the following SOP categories:

Section No.	Section Title
01	General Procedures
02	Field Procedures
03	Field Documentation Procedures
04	Packaging and Shipping Procedures
05	Field Equipment Operation and Maintenance Procedures
06	Groundwater Sampling/Monitoring and Analysis Procedures
07	Soil/Sediment Sampling and Analysis Procedures
08	Surface Water Sampling and Analysis Procedures
09	Health and Safety Procedures
10	Regulatory Compliance Procedures

11	Quality Assurance Procedures
12	Incineration/BIF Sampling and Analysis Procedures
13	Waste Sampling and Analysis Procedures

Definitions

Degradation

The loss of or change in the fabric's chemical resistance or physical properties due to exposure to chemicals, use, or ambient conditions (e.g., sunlight).

Penetration

The movement of chemicals through zippers, stitched seams, or imperfections (e.g., pinholes) in a protective clothing material.

Permeation

The process by which a chemical dissolves in and/or moves through a protective clothing material on a molecular level.

Percutaneous

The process by which a chemical has the ability to enter the body or cause an effect through skin contact.

NIOSH

National Institute for Occupational Safety and Health.

Immediately Dangerous to Life and Health (IDLH)

Any condition that poses an immediate or delayed threat to life or would cause irreversible adverse health effects.

Responsibilities

All Employees

Each employee is required to inspect his/her PPE prior to use, training, and maintenance. Each employee is required to wear the PPE specified by the SHSO and the HASP/HSEC.

Health and Safety Officer (HSO)

The HSO or designee has the primary responsibility for the selection of PPE and must approve all PPE selected for use during field activities. (See pages 11 through 16 for PPE levels.)

Site Health and Safety Officer (SHSO)

This SOP must be carefully considered and followed by the SHSO in development of each site-specific HASP/HSEC. The SHSO is responsible for ensuring the HASP/HSEC required PPE is worn in an appropriate manner. The SHSO has the authority to upgrade or downgrade to a different level of PPE protection when conducting field activities. The SHSO is required to document in the field logbook any deviations from the PPE requirements of the HASP/HSEC, PPE upgrades or downgrades, and the rationale for the decision.

Equipment Coordinator

The Equipment Coordinator is responsible for inspecting equipment that is newly received, about to be issued, or that is maintained in storage for more than one year.

Introduction

To internally harm the body, chemicals must first gain entrance. The intact skin and the respiratory tract are usually the first body tissues attacked by chemical contaminants. These tissues provide barriers to some chemicals, but in many cases are damaged themselves or are highly permeable by certain chemical compounds. PPE, therefore, is used to minimize or eliminate chemical contact with these first barrier tissues.

Use of PPE is required by OSHA regulations in 29 CFR 1910 and is reinforced by EPA regulations in 40 CFR Part 300 which include requirements for all private contractors working on Superfund sites to conform to applicable OSHA provisions and any other federal or state safety requirements deemed necessary.

The proper selection of equipment is important in preventing exposures. The HSO or designee is required to make his/her selection taking into consideration several factors. The level of protection, type, and kind of equipment selected depends on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors must be made before work can be safely carried out. No single combination of PPE is capable of protecting against all hazards. Thus, PPE should be used in conjunction with other protective methods. The use of PPE can itself create significant worker hazards, such as heat stress, physical and psychological stress, and impaired vision, mobility, and communication. In general, the greater the level of PPE protection, the greater are the associated risks. For any given situation, equipment and clothing should be selected that provide an adequate level of protection. Over-protection as well as under-protection can be hazardous and should be avoided; although in situations with multiple hazards or multiple chemicals, a conservative approach is the rule.

Types of PPE

The following types of PPE form the basis of the protective clothing scheme.

Head Protection

Regulated by 29 CFR 1910.135; requirements for equipment purchased after July 5, 1994, are specified in ANSI Z89.1-1986, American National Standard for Personal Protection-Protective Headwear for Industrial Workers-Requirements. Requirements for equipment purchased before July 5, 1994, are specified in ANSI Z89.1-1969, American National Standard Safety Requirements for Industrial Head Protection. Head protection equipment includes hard hats and hard hat liners.

Eye and Face Protection

Regulated by 29 CFR 1910.133; requirements for equipment purchased after July 5, 1994, are specified in ANSI Z87.1-1989, American National Standard Practice for Occupational and Educational Eye and Face Protection. Requirements for equipment purchased before July 5, 1994, are specified in ANSI Z87.1-1968, USA Standard for Occupational and Educational Eye and Face Protection. Eye and face protection equipment includes face shields, safety glasses, splash hoods, and goggles.

Ear Protection

Regulated by 29 CFR 1910.95; specified in 41 CFR Part 50-204.10 and OSHA rulemaking. Ear protection equipment includes ear plugs, ear muffs, and head phones.

Foot Protection

Regulated by 29 CFR 1910.136; requirements for equipment purchased after July 5, 1994, are specified in ANSI Z41-1991, American National Standard for Personal Protection-Protective Footwear. Requirements for equipment purchased before July 5, 1994, are specified in ANSI Z41.1, Safety Toe Footwear (1967). Foot protection equipment includes safety boots and overbooties.

Hand Protection

Regulated by 29 CFR 1910.138. Hand and arm protection equipment includes inner gloves, overgloves, and sleeves.

Respiratory Protection

Regulated by 29 CFR 1910.134; specified in ANSI Z88.2-1969. See the TechLaw EH&S Practice Respiratory Program for specific kinds of respiratory equipment.

Protective Clothing

Not specifically regulated. Protective clothing equipment includes fully encapsulating suits, non-encapsulating suits, aprons, leggings, sleeve protectors, blast and fragmentation suits, radiation contamination protective suits, flame/fire retardant coveralls, flotation gear, and cooling garments.

Protective Clothing Selection Criteria

It is vital that the SHSO consider the following elements and be thorough while gathering information during the preparation of the HASP/HSEC. After careful consideration of the hazards and activities to be involved in the field activity, PPE is chosen and incorporated into the HASP/HSEC and approved by the HSO or designee. All on-site deviations from the PPE specified in the HASP/HSEC must be documented in the field logbook by the SHSO, including the rationale for the deviation.

Chemicals Present

The most important factors in selecting PPE is determining to which chemicals the employee may be exposed. On a hazardous waste site this may range from a few to several hundred. Determining the exact chemicals or group of chemicals (certain groups tend to require similar protection such as aliphatic chlorinated hydrocarbons) can be done by taking samples of the air, soil, water, or other site media. Research into the site history can be used to infer which hazardous chemicals may be found on the site if data are lacking. Once the chemical(s) has been identified and the type of work to be performed has been considered, the most appropriate clothing is then selected.

Protective garments can be made of one or several different substances for protection against specific chemicals. Garments are selected for use by their resistance to permeation, degradation, and penetration. However, no material protects against all chemicals and combinations of chemicals, and no currently available material is an effective barrier to any prolonged chemical exposure, since all will decompose, be permeated by, or otherwise fail to protect under given circumstances. Charts are available from most manufacturers and other sources indicating the resistance of their products to degradation, but often do not calculate for permeation, penetration, or other types of failure by the material. For this reason, guides must be used with caution. When permeation tables are available, they must be used in conjunction with degradation tables.

In addition, when reviewing vendor literature on PPE effectiveness, it is also important to be aware that the data provided are of limited value because the quality of vendor test methods may be inconsistent. Vendors often rely on the raw material manufacturers for data rather than conducting their own tests; and the data may not be updated regularly.

Finally, the vendor data cannot address the wide variety of uses and challenges to which the PPE may be subjected.

Permeation of materials is one of the most complex issues when selecting PPE since the rate of permeation is a function of several factors. These factors include clothing material type and thickness, manufacturing method, the concentration(s) of the hazardous substance(s), temperature, pressure, humidity, the solubility of the chemical in the clothing material, and the diffusion coefficient of the permeating chemical in the clothing material. Thus permeation rates and breakthrough time may vary depending on these conditions.

During most site work, chemicals are usually in mixed combinations for which specific data with which to make a good PPE selection are not available. Due to a lack of testing, only limited permeation data for multicomponent liquids are currently available. Mixtures of chemicals can be significantly more aggressive towards PPE materials than can any single component alone. Even small amounts of a rapidly permeating chemical may provide a pathway that accelerates the permeation of other chemicals.

Due to the fact that protective material is not in continuous contact with chemical mixtures for long periods of time at hazardous waste sites, the PPE should be selected that offers the widest range of protection against the chemicals expected on site. Therefore, the selected material may be adequate for the particular work being done, yet may not be the "best" protecting material. Selection shall depend upon the most hazardous chemicals based on skin hazard and concentration. Sometimes layering - using several different layers of protective materials - affords the best protection. Alternately, vendors are now providing PPE material - composed of two or even three materials laminated together - that is capable of providing the best features of each material.

Concentration of the Chemical(s)

One of the major criteria for selecting protective material is determining the concentration of the chemical(s) in the air, liquids, or solids. Exposure levels should be compared to the OSHA standards or ACGIH guidelines to determine the level of skin protection needed. The standards are not designed for skin exposed directly to the liquid. For example the airborne levels of PCB at a site may be low because it is not very volatile, but the liquid coming into direct contact with the skin may cause an over-exposure.

Physical State

The characteristics of a chemical may range from non-toxic to extremely toxic, depending on its physical state. Inorganic lead in soil would not be considered toxic to site personnel unless it became airborne, simply because it is not easily absorbed through the skin. However, organic lead in a liquid could be readily absorbed. Soil is frequently contaminated with hazardous materials. Concentrations will vary from a few parts per million to nearly 100 percent. The degree of hazard is dependent on the type of soil (e.g., amount of clay) and concentration of the chemical. In order for the chemical to permeate the material, it must first migrate to the surface of the ground in either a liquid or vapor state, thus limiting the amount which is available to breakthrough. Generally speaking, "dry" soils do not cause a hazard to site personnel if they take minimal precautions such as wearing some type of light-weight gloves.

Length of Exposure

The length of time a material is exposed to a chemical increases the probability of breakthrough. Determinations of actual breakthrough times for short-term exposures indicate that several different materials can be used which would be considered to be inadequate under long-term exposures. It should be kept in mind that during testing usually a pure (i.e., 100 percent composition) liquid is placed in direct contact with the material producing a worst-case situation.

Abrasion

When selecting protective clothing, the job the employee is engaged in must be taken into consideration. Persons moving drums will need added protection for their hands, lower chest, and thighs. The use of leather gloves and a heavy apron over their other protective clothing will prevent damage and thus exposures.

Dexterity

As with abrasion, the ability to function must be maintained. A person cannot be expected to do work that requires fine dexterity if he/she has to wear a thick 20 mil. glove.

Ability to Decontaminate

If disposable clothing cannot be used, the ability to decontaminate the materials selected must be taken into consideration. Once a chemical is absorbed by the material, it must be cleaned before it can be reused. If the chemical has completely permeated the material, it is unlikely that the clothing can be adequately decontaminated.

Climatic Conditions

The human body works best with few restraints from clothing. Protective clothing adds a burden by adding weight and restricting movement as well as preventing the natural cooling process. In severe situations, a modified work program must be used. This program should be set up by the SHSO in consultation with the HSO or designee. Some materials act differently when they are very hot and very cold. For example, PVC becomes almost brittle in very cold (< 0°F) temperatures. If there is any question, the manufacturer should be contacted.

Workload

Like climatic conditions, the amount of protective materials a person has to wear will affect his/her ability to perform certain tasks. A person in a total encapsulating suit, even at 72°F cannot work for more than a short period of time without requiring a break. The work schedule has to be adjusted to maintain the health of the employees. Special consideration should be made when selecting clothing. It should both protect and add the least possible burden.

Types of Protective Materials

The following materials are generally available for a variety of garments:

- Cellulose or paper;
- Natural and synthetic fibers;
- Tyvek;

- Nomex;
- Elastomers:
    - Polyethylene,
    - Saran,
    - Polyvinyl chloride,
    - Neoprene,
    - Butyl rubber,
    - Chlorapel, and
    - Viton;
- Laminates:
    - Silver Shield/4H.

Protection Levels

The HSO must assemble the individual components of clothing and equipment into a full protective ensemble that both protects employees from the site-specific hazards and minimizes the hazards and drawbacks of the PPE ensemble itself. Ensembles are based on the widely used EPA Levels of Protection: Levels A, B, C, and D and low-level radiation protection, as described below. However, each ensemble must be tailored to the specific situation in order to provide the most appropriate level of protection. The type of equipment used and the overall level of protection should be periodically reviewed by the HSO or designee as the amount of information about the site increases and as workers are required to perform different tasks. The SHSO is responsible for making field decisions about upgrading or downgrading PPE, using the information listed below.

Reasons to upgrade:

- Known or suspected presence of dermal hazards,
- Occurrence or likely occurrence of gas or vapor emission,
- Change in work task that will increase contact or potential contact with hazardous materials, and

- Request of the individual performing the task.

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally thought,
- Change in site conditions that decreases the hazard, and
- Change in work task that will reduce contact with hazardous materials.

Level A Protection

Level A protection (a fully encapsulated suit) is used when percutaneous hazards exist or when there is no known data that positively rule out percutaneous hazards. Since Level A protection is extremely physiologically and psychologically stressful, the decision to use this protection must be carefully considered and be approved by the HSO or designee. The following conditions suggest a need for Level A protection:

- Confined facilities where probability of skin contact is high;
- Sites containing known percutaneous hazards;
- Sites with no established history to rule out percutaneous hazards;
- Atmosphere immediately dangerous to life and health through a skin absorption route;
- Site exhibiting signs of acute mammalian toxicity (e.g., dead animals, illnesses associated with past entry into site by humans);
- Sites at which sealed drums of unknown materials must be opened;
- Total atmospheric readings on a PID, FID, or similar instruments indicate 500 to 1,000 ppm of unidentified substances; and

- Extremely hazardous substances (e.g., dioxin, cyanide compounds, concentrated pesticides, Department of Transportation Poison "A" materials, suspected carcinogens, and infectious substances) are known or suspected to be present, and skin contact is possible.

PPE for Level A includes:

- Positive pressure, full face-piece, self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by NIOSH;
- Totally encapsulated, chemical-resistant suit;
- Gloves, inner (chemical-resistant);
- Gloves, outer (chemical-resistant);
- Boots, chemical-resistant, steel toe and shank; and
- Disposable chemical-resistant suit, gloves and boots.

Optional equipment includes:

- Radiation detector,
- Thermoluminescent dosimeter (TLD) badge,
- Communications, and
- Hardhat (under suit).

Level B Protection

Level B protection is used when the highest level of respiratory protection is needed, but hazardous material exposure to the few unprotected areas of the body is unlikely. Level B protection must be approved by the HSO or designee.

The following conditions suggest a need for Level B protection:

- The type and atmospheric concentration of toxic substances has been identified and requires the highest level of respiratory protection, but exposure to the few unprotected areas of the body (e.g., the back of the neck) is unlikely;
- IDLH atmospheres where the substance or concentration in the air does not present a severe skin hazard;
- The type and concentrations of toxic substances that do not meet the selection criteria permitting the use of air purifying respirators; and
- It is highly unlikely that the work being done will generate high concentrations of vapors, gases, particulates, or splashes of material that will affect the skin.

PPE for Level B includes:

- Positive pressure, full face-piece, self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by NIOSH;
- Chemical-resistant overalls and long-sleeved jacket or chemical-resistant coveralls (the jacket or coveralls must have a hood);
- Gloves, inner (chemical-resistant);
- Gloves, outer (chemical-resistant); and
- Boots, chemical-resistant, steel toe and shank.

Optional equipment includes:

- Boot covers, outer, chemical-resistant (disposable),
- Hard hat,
- Face shield,
- Radiation detector,

- TLD badge, and
- Communications.

Level C Protection

Level C is specified when the required level of respiratory hazard is known, or reasonably assumed to be not greater than the level of protection afforded by air purifying respirators; and hazardous materials exposure to the few unprotected areas of the body (e.g., the back of the neck) is unlikely. Level C may require carrying an emergency escape respirator. Level C PPE must be available for all field activities where Level D PPE has been prescribed.

PPE for Level C includes:

- Full facepiece, air-purifying respirator (with spectacle insert if required);
- Chemical-resistant overalls and long-sleeved jacket or coveralls;
- Gloves, inner (chemical-resistant);
- Gloves, outer (chemical-resistant);
- Boots, chemical-resistant, steel toe and shank; and
- Hearing protection (foam plugs or muffs).

Optional equipment includes:

- Radiation detector,
- TLD badge,
- Emergency escape respirator (carried, optional), and
- Boot covers, outer, chemical-resistant (disposable).

Level D Protection

Level D is the basic work uniform and minimum PPE for a site visit and shall be worn as appropriate.

PPE for Level D includes:

- Coveralls or long pants and a long sleeve shirt,[1]
- Boots, chemical-resistant, steel toe and shank,[1]
- Safety glasses or chemical splash goggles (optional: at discretion of SHSO),[2]
- Hearing protection (foam plugs or muffs) (optional: at discretion of SHSO),[3] and
- Hard hat (optional: at discretion of SHSO).[4]

Optional equipment includes:

- Radiation detector and

[1]The removal of safety boots or the long-sleeved shirt/coveralls is never acceptable.

[2]There are occasions when safety glasses may be removed temporarily (e.g., a closeout meeting in a conference room or a tour of an enclosed control room). This is an acceptable practice and in the above instances would not require an entry in the field logbook. However, when not in a similar nonhazardous setting, safety glasses are required.

[3]Hearing protection is to be worn in any circumstance where an employee feels it is necessary and whenever entering a posted High Noise/Hearing Protection Required area.

[4]A hard hat is required whenever there is an overhead hazard. If an employee finds himself/herself with no overhead hazards (i.e., an open field, no moving equipment or construction activities), removal of the hard hat is appropriate.

- TLD badge.

Low-Level Radiation Protection

Radiological safety experts available through the HSO must be consulted to determine adequate safety and sampling equipment, protective gear, monitoring methods, handling procedures, and remedial options.

Minimum PPE for low-level radiation includes:

- Coveralls;
- Full face, air purifying respirator;
- Time limits on exposure;
- Appropriate dermal protection for type of radiation present; and
- Radiation dosage monitoring.

<u>Personal Protective Equipment Use</u>

PPE can offer a high degree of protection only if it is used properly. Proper use must include training, work mission duration, donning and doffing, inspection, and storage.

Training

Training in PPE use is required for all personnel taking part in field activities. The training requirement is typically met by attending a Hazardous Waste Worker 8-Hour Refresher. This training:

- Allows the user to become familiar with the equipment in a nonhazardous situation;
- Instills confidence of the user in his/her equipment;
- Makes the user aware of the limitations and capabilities of the equipment;

- Increases the efficiency of operations performed by workers wearing PPE;
- May increase the protective efficiency of PPE use; and
- Reduces the expense of PPE maintenance.

Training should be completed prior to actual PPE use in a hazardous environment and should be repeated at least annually. At a minimum, the training portion of the PPE program should delineate the user's responsibilities and explain the following, utilizing both classroom and field training when necessary:

- The proper use and maintenance of the selected PPE, including capabilities and limitations;
- The nature of the hazards and the consequences of not using the PPE;
- The human factors influencing PPE performance;
- Instruction in inspecting, donning, checking, fitting, and using PPE;
- Use of PPE in normal air for a long familiarity period and, finally, wearing PPE in a test atmosphere to evaluate its effectiveness;
- The user's responsibility (if any) for decontamination, cleaning, maintenance, and repair of PPE; and
- Emergency procedures and self-rescue in the event of PPE failure.

Work Mission Duration

Before employees actually begin work in their PPE ensembles, the anticipated duration of the work mission must be established by the SHSO. Several factors limit mission length. These include:

- Air supply consumption,
- Suit/ensemble permeation and penetration by chemical contaminants,

- Ambient temperature, and
- Coolant supply.

Donning and Doffing

A routine should be established and practiced periodically for donning and doffing a fully-encapsulating suit/SCBA ensemble. Assistance should be provided for donning and doffing since these operations are difficult to perform alone, and solo efforts may increase the possibility of suit damage.

Once the equipment has been donned, its fit should be evaluated. If the clothing is too small, it will restrict movement, thereby increasing the likelihood of tearing the suit material and accelerating employee fatigue. If the clothing is too large, the possibility of snagging the material is increased; and the dexterity and coordination of the employee may be compromised. In either case, the employee should be recalled and better fitting clothing provided.

Exact procedures for removing fully-encapsulating suit/SCBA ensembles must be established and followed in order to prevent contamination migration from the work area and a transfer of contaminants to the wearer's body, the doffing assistant, and others.

Inspection

Chemicals that have begun to permeate clothing during use may not be removed during decontamination and may continue to diffuse through the material towards the inside surface, presenting the hazard of direct skin contact to the next person who uses the clothing. Where such potential hazards may develop, clothing must be inspected inside and out for discoloration or other evidence of contamination by the SHSO.

An effective PPE inspection program will probably feature five different inspections:

- Inspection and operational testing of equipment received from the factory or distributor;
- Inspection of equipment as it is issued to employees;

- Inspection before and after use, training, and maintenance;

- Periodic inspection of stored equipment; and

- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.

Each inspection will cover somewhat different areas in varying degrees of depth. Detailed inspection procedures, where appropriate, are usually available from the manufacturer. The Equipment Coordinator is responsible for inspecting and testing equipment when it is received from the factory or distributor, yearly if kept in storage, and prior to issuance to employees. Individual employees are responsible for inspection both before and after use, training, or maintenance. When a question arises as to equipment appropriateness or reliability, the Equipment Coordinator and the HSO or designee will resolve the issue in consultation with the affected employees.

Records must be kept of all inspection procedures. Individual identification numbers should be assigned to all reusable pieces of equipment and records should be maintained by that number. At a minimum, each inspection should record the ID number, date, inspector, and any unusual conditions or findings. Periodic review of these records may indicate an item or type of item with excessive maintenance costs or a particularly high level of "down-time."

Storage

Clothing must be stored properly to prevent damage or malfunction due to exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact. Many equipment failures can be directly attributed to improper storage. Proper storage includes the following:

- Potentially contaminated clothing should be stored in an area separate from street clothing;

- Potentially contaminated clothing should be stored in a well-ventilated area, with good air flow around each item, if possible;

- Different types and materials of clothing and gloves should be stored separately to prevent issuing the wrong material by mistake; and
- Protective clothing should be folded or hung in accordance with manufacturers' recommendations.

Additional Considerations

A hazardous work site will contain a variety of situations due to chemicals in various concentrations and combinations. These situations may be partially offset by following the work practices listed below.

- Some sort of foot protection is needed on a site. If the ground to be worked on is contaminated with liquid and it is necessary to walk in the chemicals, protective disposable booties are to be worn over the boots. This will reduce decontamination requirements. Most are designed with soles to help prevent them from slipping around in the boot. For example, a PVC bootie with elastic tops is available from several manufacturers. If non-liquids are to be encountered, a Tyvek bootie could be used. If the ground contains any sharp objects, the advantage of booties is questionable. Boots should be worn with either cotton or wool socks to help absorb perspiration.
- If the site situation requires the use of hard hats, chin straps should be used if a person will be stooping over where his/her hat may fall off. Respirator straps should not be placed over hard hats as it would seriously affect the fit of the respirator.
- Some types of protective materials conduct heat and cold readily. In cold conditions, natural material (e.g., cotton) clothing should be worn under the protective clothing. Protective clothing should be removed prior to a person feeling excessively warm or perspiring heavily. Applying heat, such as a space heater, to the outside of the protective clothing may drive through the contaminants. In hot weather, underclothing will absorb sweat. It is recommended that hazardous waste site workers use all cotton undergarments.
- Body protection should be worn and taped to prevent materials from entering the top of the boot. Gloves should be worn and taped to prevent substances from entering the top of the glove, with duct tape being the preferred material. When aprons are used, they

should be taped across the back for added protection. However, this should be done in such a way that the person has mobility.

- Atmospheric conditions such as precipitation, temperature, wind direction, wind velocity, and pressure determine the behavior of contaminants in the atmosphere and the potential for volatile material getting into the atmosphere. These parameters should be considered in determining the need for protection and at what level it should be practiced.

- A program must be established for periodic monitoring of the air during site operations. Without an air monitoring program, any changes could go undetected and might jeopardize on-site personnel. Monitoring can be done with various types of air pumps and filtering devices followed by analysis of filtration media, portable real-time monitoring instruments located strategically on-site, personnel dosimeters, and periodic walk-throughs by personnel carrying real-time survey instruments.

- For operations in the on-site exclusion zone (i.e., area of potential contamination), different levels of protection may be selected and various types of chemical-resistant clothing may be worn. This selection would be based not only on the job function or reason for being in the area, but on the potential for skin contact and/or inhalation of the materials present.

- Escape masks should be made readily available when levels of respiratory protection do not include a SCBA and the site has the potential for sudden increases in atmospheric contaminants. Their use can be made on a case-by-case basis.

Health and Safety

It is TechLaw's policy to maintain an effective program for control of employee exposure to chemical, radiological, and physical stress which is consistent with OSHA and other applicable and appropriately established standards and requirements.

All field personnel will be provided with appropriate personal protective clothing and safety equipment. At a minimum, this will include a hardhat, hearing protection, full-face respirator, steel-toed safety shoes, and safety glasses. Personnel are required to inspect their PPE prior to entering any job site and replace any damaged items.

A site-specific health and safety checklist/plan must be developed by the SHSO and approved by the HSO or designee prior to implementation in the field. This checklist/plan must be reviewed with the field team members prior to beginning work.

Any deviation(s) from an approved site-specific health and safety checklist/plan must be documented in the field logbook.

QA/QC

None at this time.

Comments/Notes

None at this time.

Attachments

None at this time.

References

TechLaw, Inc., Field Equipment Manufacturers' Instruction Manuals Handbook, Winter 1995.

TechLaw, Inc., Health and Safety Program, 1999.

TechLaw, Inc., Health and Safety Project Plan for Field Activities, 1999.

TechLaw, Inc., Quality Assurance Program Plan (as amended for the RCRA Enforcement, Permitting, and Assistance Contract).

American National Standard for Personal Protection-Protective Headwear for Industrial Workers-Requirements, ANSI Z89.1-1986.

American National Standard Safety Requirements for Industrial Head Protection, ANSI Z89.1-1969.

American National Standard Practice of Occupational and Educational Eye and Face Protection, ANSI Z87.1-1989 and ANSI Z87.11968.

American National Standard for Personal Protection-Protective Footwear, ANSI Z42-1991 and ANSI Z41.1

Code of Federal Regulations, Office of the Federal Register, National Archives and Records Administration, 29 CFR Parts 1910.95, 1910.133 through 1910.136, and 1910.138 and 41 CFR Part 50-204.10.

Technical Approval: ______________________ Date: 12/20/99

QA Management Approval: ______________________ Date: 3/23/00

SOP Description

This Standard Operating Procedure (SOP) establishes the procedures for the implementation, operation, and monitoring of a heat stress recognition, evaluation, and control program. The objective of the SOP is to describe signs and symptoms which characterize excessive exposure of TechLaw personnel to hot environments. Recognition of these signs and symptoms necessitates prompt corrective action to prevent permanent injury or death.

This SOP applies to all TechLaw field activities where personnel may be exposed to environments with an ambient temperature of 77 degrees Fahrenheit/25 degrees Centigrade (77°F/25°C) or higher. Field activities include any activities requiring either a health and safety plan (HASP) or health and safety evaluation checklist (HSEC).

General Procedures

Related SOPs

This SOP is to be used in conjunction with the other relevant or applicable SOPs found in the following SOP categories:

Section No.	Section Title
01	General Procedures
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Definitions

Heat-Related Problems

- **Heat Rash** - severe itching from plugged sweat glands caused by continuous exposure to hot and humid air and aggravation of the skin by chafing clothes. This decreases the ability to tolerate heat as well as being a nuisance.

- **Heat Cramps** - caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs include muscle spasm and pain in the extremities and abdomen. Personnel developing heat cramps should be observed closely for symptoms of more serious heat stress.

- **Heat Syncope** - sudden fainting caused by a reduced blood flow to the head. The victim's skin will be cool and moist and their pulse weak. Immediate medical attention is required.

- **Heat Exhaustion** - caused by increased stress on various organs to meet increased demands for body cooling. Signs include shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; lassitude; or irritability. The victim may deny heat related stress even in the presence of obvious symptoms. Once obvious symptoms are present, the victim should be removed and treated immediately.

- **Heat Stroke** - the most severe form of heat stress. Heat stroke is considered a medical emergency and the victim must receive medical treatment as soon as possible. Any person suffering from heat stroke must be cooled down immediately to prevent severe injury and/or death and taken to a hospital. Decontamination procedures should not be implemented. Signs and symptoms are red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; or coma.

Immediately Dangerous to Life and Health (IDLH)

Any condition that poses an immediate or delayed threat to life or would cause irreversible adverse health effects.

Work-Rest Regimen

This is a ratio of time spent working versus time spent resting. The ratio applies to one-hour periods. For example, a work-rest regiment of 75 percent work, 25 percent rest corresponds to 45 minutes work, 15 minutes rest each hour.

American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values and Biological Exposure Indices, 1999

Heat Stress Threshold Limit Values (TLVs) are intended to protect workers from the severest effects of heat stress and heat injury and to describe exposures to hot working conditions under which it is believed that nearly all workers can be exposed repeatedly without adverse health effects. The TLV objective is to prevent the deep body core temperature from exceeding 100°F (38°C).

Responsibilities

All Site Personnel

All site personnel must be alert to signs of development of symptoms of heat strain in themselves or signs of development of heat strain in those working with them. Personnel must also be aware of emergency corrective action described in this SOP, under "Emergency Measures".

Site Health and Safety Officer (SHSO)

The SHSO is responsible for implementing heat stress monitoring according to this SOP. He/she also is charged with enforcing the work/rest regime to control heat stress and stopping work if any employee exhibits signs/symptoms of heat stress. The SHSO is responsible for planning activities so as to minimize unacclimatized workers exposure to hot environments.

Project Manager

The project manager (e.g., work assignment manager) is responsible for staffing and planning activities so as to minimize unacclimatized employee exposure to hot environments.

Health and Safety Officer (HSO)

The TechLaw Health and Safety Officer is responsible for all facets of this SOP and has full authority to make necessary decisions to ensure its success. This authority includes approval of necessary equipment purchases and assignment of qualified persons to act as site safety officers. The HSO is responsible for providing guidance to both the SHSO and field personnel as required.

Recognition

Adverse weather conditions are important considerations in planning and conducting site operations. Hot weather can cause physical discomfort, loss of efficiency, and personal injury. Wearing personal protective equipment (PPE) puts employees at considerable risk of developing heat stress since protective clothing decreases natural body ventilation.

Heat stress can be explained as any factor or set of conditions which places excessive demands on the normal regulation of body temperature. The ACGIH defines heat stress as an environment which is at or above the Wet-Bulb Globe Temperature (WBGT) Index of 79°F. The WBGT is a computation of the environmental thermal stress which includes an assessment of the air temperature, humidity, and radiant thermal load.

Heat can be transferred in three ways:

1. Conduction -The transmission of heat through substances or from one substance to another when in direct physical contact, such as a frying pan on a stove.

2. Convection - The transfer of heat from one place to another by moving gas or liquid, including air. An example would be a forced air furnace.

3. Radiation - The transfer of heat from one object to another through air or a vacuum by infrared waves, such as sunlight.

Once heat is transferred from one object to another, this energy is either reflected away or absorbed. When energy is absorbed, there is an increase in the internal heat load and an increase in temperature. The human body has a number of mechanisms for dealing with excess heat, such as sweating, but these mechanisms can be overwhelmed if the incoming heat is not balanced by outgoing heat.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at work sites, a heat stress evaluation procedure including regular monitoring and other preventive precautions is essential to the health and safety of personnel conducting field work.

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur ranging from mild (e.g., fatigue; irritability; anxiety; and decreased concentration, dexterity, or movement) to fatal.

Heat-related problems include heat rash, heat cramps, heat exhaustion, and heat stroke. It is important to note that individuals vary in their susceptibility and their reactions to heat related conditions. Factors that may predispose someone to a heat condition include:

- Lack of physical fitness,
- Lack of acclimatization,

- Lack of sleep,
- Age,
- Dehydration,
- Obesity,
- Alcohol and drug use,
- Infection,
- Sunburn,
- Diarrhea, and
- Chronic disease.

Acclimatization to heat is an important element in any individual's susceptibility to heat stress. Acclimatization to heat involves a series of physiological and psychological adjustments that occur in an individual during his initial exposure to hot environmental conditions. The work-rest regimen in this procedure is valid for acclimated employees who are physically fit. Extra caution must be employed when unacclimated or physically unfit employees must be exposed to heat stress conditions. The susceptibility of unacclimatized employees shall be taken into consideration when staffing projects involving potential exposure to hot environments.

Work Rest Regimen

The SHSO will ensure the following steps are taken at each field activity:

- For each two hours worked, a ten minute break will be taken. The breaks should be taken in an air-conditioned space (such as an automobile) if at all possible.
- A lunch break of at least one-half hour duration will be taken each day.

- A cooler containing drinking water or a electrolite type drink will be made available. One gallon of liquid per person will be available for every four hours worked. The cooler will contain enough ice to keep the liquid at 50-60°F and will be made available during breaks and at lunch. If the cooler cannot be made available during breaks, the SHSO will ensure that an alternate source of cool drinking water is made available.

The SHSO and all field team members will immediately report any of the following symptoms in themselves or other field team members: muscle pain or cramps, excessive sweating or signs of confusion, dizziness or exhaustion. Should any of these symptoms appear, the SHSO will immediately relieve the affected individual of all duties and place them in an air-conditioned space with access to cool liquids for a minimum of 30 minutes or more if required for recovery. The SHSO will contact the HSO (or designee) or the Medical Consultant, Mark Strauss, M.D. prior to the affected individual resuming his/her duties. At the first indication of heat stress in any field team member, the entire team will be put on a work-rest regimen of 45 minutes work, 15 minutes rest. The work-rest regimen can be modified to include longer rest periods if deemed necessary by the SHSO.

Work Rest Regime with use of PPE

For field activity where special clothing is required, the permissible heat exposure limit shall be established by the SHSO and the HSO along with the assistance of well-trained field workers. The SHSO as well as the employees in the field must be trained to identify any symptoms associated with heat stress conditions within themselves or their co-workers. If any symptoms are identified by the employee or co-worker, the SHSO should be notified immediately and all work activity should cease until the situation is corrected. Biological monitoring and heat stress control practices can aid in avoiding heat stress conditions regardless of PPE implementation.

Biological Monitoring

The following procedure shall be followed by the SHSO when PPE requirements include coveralls, tyvek or other chemically resistant/impermeable clothing or PPE above Level D, the work-place temperature is 77°F (25°C) and cooling devices (ice vests, etc.) are not available or used. The procedure shall also be implemented if any field team member exhibits symptoms of heat stress. The monitoring is intended to ensure the work/rest regime is providing proper personal protection and to document exposure. Each individual worker will take the following personal measurement as directed by the SHSO:

- Measure heart rate (HR) by the pulse for 30 seconds as early as possible in the resting period. This value should be multiplied by 2 to obtain the beats per minute pulse. The HR at the beginning of the rest period should not exceed 110 beats/min. If the HR is higher, the field team will then go to a work-rest regime of 45 minutes work and fifteen minutes rest. If the pulse rate is >110 beats/min. at the beginning of the next rest period, shorten the following work cycle to 30 minutes work, 30 minutes rest.

Heat Stress Control

Of particular importance is heat stress resulting when PPE decreases natural body ventilation. The SHSO shall ensure that one or more of the following is used to prevent or reduce heat stress.

- Make drinking water available to employees in such a way that they are stimulated to frequently drink small amounts (i.e., one cup every 15-20 minutes [about 150 ml or 1/4 pint]). Keep the water reasonably cool (55-60°F/13-16°) and place it close to the workplace so that employees can reach it without abandoning the work area. Never place drinking water inside an exclusion or contamination reduction zone at a hazardous waste site.

- Encourage employees to salt their food abundantly during the hot season and particularly during hot spells. If the employees are unacclimatized, make available salted drinking water in a concentration of 0.1 percent (1 g NaCl to 1.0 liter or 1 level tablespoon of salt to 15 quarts of water). Completely dissolve the added salt before the water is distributed, and keep the water reasonably cool. Commercially available products (e.g., Gatorade) may be used in place of the salt water.

- Provide cooling devices to aid natural body ventilation or decrease heat load. These devices, however, add weight; and their use should be balanced against employee efficiency. Cotton underwear acts as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing. It should be the minimum undergarment worn.

- Provide shelter -- air-conditioned, if possible -- or shaded areas to protect personnel during rest periods.

- Install mobile showers and/or hose-down facilities to reduce body temperature and cool PPE.

- In extremely hot weather, conduct non-emergency response operations in the early morning or evening.

- In hot weather, rotate shifts of employees wearing impervious clothing.

- Add additional personnel to work teams, when necessary.

- Mandate work slowdowns when necessary.

- Maintain good hygienic standards by frequent change of clothing and daily showering. Permit clothing to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel or the TechLaw Medical Consultant, Mark Strauss, M.D..

- Instruct employees in hot weather procedures. Instructions shall include as a minimum:

  - Proper cooling procedures and appropriate first aid treatment,
  - Proper clothing practices,
  - Proper eating and drinking habits,
  - Recognition of impending heat exhaustion,
  - Recognition of signs and symptoms of impending heat stroke, and
  - Safe work practices.

Emergency Measures

All field team members are charged with the responsibility of taking action if another field team member exhibits symptoms of heat stress. It is always better to take small measures to avert a potential problem than to have to take large measures to correct a problem that is escalating out of control. The following measures are to be taken when any field team member exhibits symptoms of heat stress.

- If any field team member exhibits mild symptoms of heat stress, such as heat cramps or symptoms of heat exhaustion, the SHSO shall remove them to a well ventilated and shaded/air conditioned area and allow them to recover. Provide cool drinking water if possible. The effected personnel are not to be allowed to return to their duties until they are fully recovered.

- If a field team member loses consciousness, emergency medical services should be contacted immediately. The field team should then remove the unconscious person to a well ventilated and shaded/air conditioned area and lay them on the ground or floor. Either remove or loosen their clothing and fan the body surface. Elevate the individual's legs and feet if possible. When the person regains consciousness, encourage them to drink cool liquids, DO NOT force the person to drink liquids. Check to ensure that the skin is moist and cool. Determine if the individual injured themselves when they fainted and administer first aid, as required. The individual is not to be left alone until medical help arrives and is not to be exposed to heat again until cleared by the TechLaw Medical Consultant, Mark Strauss, M.D.

- If the person does not recover consciousness within 2 minutes, exhibits symptoms of heat stroke or if their skin is hot and dry, flood the skin and clothing with cool (not cold) water, fan the body vigorously, and take vigorous action to obtain immediate medical assistance.

Health and Safety

It is TechLaw's policy to maintain an effective program for control of employee exposure to chemical, radiological, and physical stress which is consistent with OSHA and other applicable and appropriate established standards and requirements.

All field personnel will be provided with appropriate personal protective clothing and safety equipment. At a minimum, this will include a hardhat, hearing protection, full-face respirator, steel-toed safety shoes, and safety glasses. Personnel are required to inspect their PPE prior to entering any job site and replace any damaged items.

A site-specific health and safety checklist/plan must be developed by the field team leader or designee and approved by the HSO prior to implementation in the field. This checklist/plan must be reviewed with the field team members prior to beginning work.

Any deviation(s) from an approved site-specific health and safety checklist/plan must be documented in the field logbook.

QA/QC

None at this time.

Comments/Notes

None at this time.

References

American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices, current version.

TechLaw, Inc., Health and Safety Program, 1999.

TechLaw, Inc., Health and Safety Project Plan for Field Activities, 1999.

TechLaw, Inc., Quality Assurance Program Plan (as amended for the RCRA Enforcement, Permitting and Assistance Contract).

Technical Approval: David M. Walker Date: 6/21/99

QA Management Approval: John W Goode Date: 7/5/99

SOP Description

This Standard Operating Procedure (SOP) establishes the general personnel decontamination procedures to be taken during any field activity where TechLaw personnel or their personal protective equipment (PPE) become contaminated with a hazardous material. It applies to all TechLaw activities where exposure to hazardous constituents may occur.

General Procedures

Related SOPs

This SOP is to be used in conjunction with the other relevant or applicable SOPs found in the following SOP categories:

Section No.	Section Title
01	General Procedures
02	Field Procedures
03	Field Documentation Procedures
04	Packaging and Shipping Procedures
05	Field Equipment Operation and Maintenance Procedures
06	Groundwater Sampling/Monitoring and Analysis Procedures
07	Soil/Sediment Sampling and Analysis Procedures
08	Surface Water Sampling and Analysis Procedures
09	Health and Safety Procedures
10	Regulatory Compliance Procedures
11	Quality Assurance Procedures
12	Incineration/BIF Sampling and Analysis Procedures
13	Waste Sampling and Analysis Procedures

Responsibilities

- Health & Safety Officer (HSO) - The HSO or designee approves adequate site-specific decontamination procedures included in the site-specific health and safety plan (HASP).

- Site Health and Safety Officer (SHSO) - The SHSO develops adequate site-specific decontamination procedures for inclusion in the HASP and ensures that the procedures are conducted as specified.

- Project Manager - The project manager (e.g., work assignment manager) ensures that sufficient information is provided to the SHSO to prepare adequate decontamination procedures for inclusion in the HASP.

Definitions

- **Degradation**

  The loss of or change in the fabric's chemical resistance or physical properties due to exposure to chemicals, use, or ambient conditions (e.g., sunlight).

- **Penetration**

  The movement of chemicals through zippers, stitched seams, or imperfections (e.g., pinholes) in a protective clothing material.

- **Permeation**

  The process by which a chemical dissolves in and/or moves through a protective clothing material on a molecular level.

- **Percutaneous**

  The process by which a chemical has the ability to enter the body or cause an effect through skin contact.

Introduction

TechLaw personnel who may become contaminated with hazardous materials during the course of their work at a site, should use contamination avoidance procedures along with PPE to help prevent the wearers from becoming contaminated or inhaling contaminants. However, even with such safeguards, contaminants can settle on the surface of PPE or eventually permeate into the PPE material, respiratory equipment, tools, vehicles, and other equipment used at a site. This creates the possibility that those hazardous materials may be transported away from the site. Contaminants that have permeated a material are difficult or impossible to detect and remove. If contaminants that have permeated a material are not removed by decontamination, they may continue to permeate where they can cause an unexpected exposure.

The following five major factors affect the extent of permeation:

- **Contact Time** - The longer a contaminant is in contact with an object, the greater the probability and extent of permeation, penetration, or degradation. For this reason, minimizing contact time is one of the most important objectives of a decontamination program.

- **Concentration** - Molecules flow from areas of high concentration to areas of low concentration. As concentrations of wastes increase, the potential for permeation of personnel protective clothing increases.

- **Temperature** - An increase in temperature generally increases the permeation rate of contaminants.

- **Size of Contaminant Molecules and Pore Space** - Permeation increases as the contaminant molecule becomes smaller and as the pore space of the material to be permeated increases.

- **Physical State of Wastes** - As a rule, gases, vapors, and low-viscosity liquids tend to permeate more readily than high-viscosity liquids or solids.

Good work practices should be utilized to help reduce the contamination of protective clothing, instruments, and equipment and consequently aid in avoiding the transfer of harmful materials into clean areas. Despite contamination avoidance practices and PPE, contamination can still occur. Decontamination procedures are implemented at sites to remove any contaminants that remain upon leaving a contaminated site.

Upon the removal of contaminated clothing, personnel may come in direct contact with and/or inhale the contaminants. To prevent such occurrences, decontamination procedures must be in place and understood by all TechLaw employees at the site before anyone enters a hazardous area, and they must continue (modified as necessary) throughout the period of operation.

Decontamination involves physically removing contaminants and/or converting them chemically into innocuous substances. The extent of decontamination depends upon a number of factors, the most important being the types of contaminants involved. The more harmful the contaminant, the more extensive and thorough decontamination must be. Combining decontamination with the correct donning of protective clothing, as well as ensuring proper zoning of site work areas, minimizes cross-contamination from protective clothing to wearer, from equipment to personnel, and from one area to another. Since procedures should be situation-specific, only general guidance can be given on methods and techniques for decontamination.

A major factor in determining decontamination methodology is the job description. For example, disposable clothing can often be used on RCRA sites. On CERCLA and other hazardous waste sites, full decontamination stations must be planned and setup. However, the exact procedure is determined by evaluating a number of factors specific to the situation.

Preliminary Concerns

Initial Planning

The initial decontamination plan must be adapted to specific conditions found at a work site. These conditions require differing amounts of personnel decontamination. If no information is available about the work area, the decontamination plan must be based on a worst-case scenario, which consists of gross contamination of all personnel and equipment exiting the Exclusion Zone (EZ). In this case, a system is employed for a thorough washing and rinsing of all protective equipment worn and tools and equipment entering the EZ. The washing and rinsing are done in combination with a sequential removal of equipment and clothing, starting at the first station with the most heavily contaminated article and progressing to the last station with the least contaminated article. Each piece of clothing or equipment requires a separate station in order to prevent cross contamination. In less contaminated areas, such as most RCRA sites, a less extensive system may be implemented where only disposable garments are used.

Upon completion of the workday or if any article deteriorates or tears, disposable clothes may be thrown away with the client's other wastes. Other sites may require a combination of the two systems where employees wear disposable boot covers and gloves, eliminating washing and rinsing of these items and thereby reducing the number of wash/rinse stations needed.

During the course of a field activity, the conditions upon which the decontamination procedures was based may change. In this case, the SHSO is responsible for making the appropriate changes in the decontamination procedure. If the change involves a major change in the procedure (e.g., substituting a cleaning solvent for water/detergent), the HSO or designee must be notified prior to changing the decontamination procedure.

Contamination Avoidance

Contamination avoidance is the first and best method for preventing spread of contamination from a hazardous site. While planning site operations, methods are to be developed to prevent the contamination of personnel and equipment. Each person involved in site operations must regularly practice the basic methods of contamination avoidance listed below:

- Know the limitations of all protective equipment being used.
- Do not enter a contaminated area unless it is necessary to carry out a specific objective.
- When in a contaminated area, avoid touching anything unnecessarily.
- Walk around pools of liquids, discolored areas, or any area that shows evidence of possible contamination.
- Walk upwind of contamination, if possible.
- Do not sit or lean against anything in a contaminated area. In cases where you have to kneel (e.g., to take samples), use a plastic ground sheet.

- Before sampling any hazardous waste, read the label, manifest (if available), or MSDSs for all containers to determine as best you can the identity of the substance and its potential for contamination. Be cautious - the label may not accurately reflect contents.

- While checking for waste contents, check for potential incompatibility of wastes. These conditions might be caused by heat, fire, gas, and explosion; the contact of water and alkali metals; violent polymerization; or solubilization of toxic substances. Check waste containers for evidence of these conditions! Signs to look for include: bulged or exploded drums, blistered paint, bubbles, dead vegetation, or melted plastic.

- If at all possible, do not set sampling equipment directly on contaminated areas. Place equipment on a protective cover such as a ground cloth.

- Use the proper tools necessary to safely conduct the study. Use of very specific methods to help reduce the chance of contamination is important. Examples of such methods include: using remote sampling techniques, opening containers by non-manual means, bagging monitoring instruments, using drum grapplers and watering down dusty areas. Avoiding areas of obvious contamination to reduce the possibility of contamination and to preclude a more elaborate decontamination procedure also proves important.

Site Organization

For activities where the possibility of contamination of TechLaw personnel exists, the SHSO must develop a formal site organization plan that includes: an Exclusion Zone (EZ), a Contamination Reduction Zone (CRZ), and a clean Support Zone (SZ). Contamination reduction and decontamination lie within the CRZ at the site's Contamination Reduction Corridor (CRC) (see Attachment A). This area provides a transition between contaminated and clean zones, controls access into and out of the EZ, and confines personnel decontamination activities to a limited area. It provides additional assurance that the physical transfer of contaminating substances on people, equipment, or in the air is limited through a combination of decontamination activities, distance between the EZ and the SZ, air dilution, zone restrictions, and work functions.

The size of the corridor depends on the wind direction (up or side wind), the number of stations in the decontamination procedure, the overall dimension of work control zones, and the amount of space available at the site. A corridor of 75 by 15 feet should be adequate for the most extensive decontamination. Whenever possible, it should be a straight path.

The CRC boundaries must be conspicuously marked, with entry and exit restricted. The far end is the "hotline" -- the boundary between the EZ and the CRZ. Personnel exiting the EZ must go through the CRC. Anyone in the CRC must be wearing the appropriate protection designated for the decontamination crew.

Another corridor may be required for the entrance and exit of heavy equipment needing decontamination. Within the CRC, distinct areas are set aside for the decontamination of personnel, portable field equipment, removed clothing, etc. These areas must be marked and restricted to those personnel wearing the appropriate protection. All activities within the corridor are confined to decontamination. The level of decontamination must be spelled out in the site-specific HASP.

The SHSO must exercise professional judgment in determining how the CRC will be organized and what decontaminants will be used. Factors that must be considered include:

- The extent and type of hazard expected,
- Explosive potential,
- Meteorological conditions,
- Topography,
- Levels of protection selected, and
- Availability of equipment and supplies.

Protective clothing, respirators, monitoring equipment, sampling supplies, and other equipment are all maintained in the Support Zone outside of the CRC. Personnel don their protective equipment away from the CRC and enter the EZ through a separate access control point at the hotline.

Decontamination

The protection selected for a site and the specific pieces of clothing worn in the EZ dictate the items required on the decontamination line. Different degrees of protection present a different situation with respect to the type of decontamination procedure required. Attachments B, C, and D outline the organization of the decontamination line for standard levels of protection: A, B, and C, respectively. For most TechLaw field activities requiring minimal decontamination, protective equipment, sampling tools, and other equipment can decontaminated by scrubbing with detergent water using a soft-bristle brush followed by rinsing with copious amounts of water and a final rinse of distilled water. However, this simple method may not always be appropriate and more rigorous methods of decontamination may occasionally be required.

Decontamination is accomplished through three methods: physical removal, chemical removal or a combination of both physical and chemical removal. Physical methods are used primarily for:

- Loose contaminants such as dusts and vapors that adhere due to being trapped in fabric weave, etc, or are captured by electrostatic forces. These contaminants are generally removed with a water rinse which can be enhanced by the use of anti-static solutions.

- Adhering contaminants can include glues, resins, mud and a variety of other substances that adhere through forces other than electrostatic attraction. Adhering contaminants vary widely and are generally removed through scraping, brushing and wiping. In some instances, removal methods such as freezing, adsorption, or melting may be required.

- Volatile liquids are removed by a water rinse followed by evaporation. Caution should be exercised to ensure that personnel are not exposed via inhalation during this process.

Chemical removal includes the following:

- Use of organic solvents such as alcohols, ethers, ketones, aromatics, alkanes or common petroleum products. The use of solvents for decontamination must be carefully weighed against their drawbacks such as toxicity, generation of regulated wastes and the ability of some solvents to damage/degrade certain materials used in PPE. The decision to use solvents for decontamination must be approved by the HSO or designee.

- Surfactants can be used to reduce the adhesion forces between contaminants and the surface being cleaned. Household detergents are a common surfactant used for decontamination.

- Solidifying liquid and gel contaminants can be accomplished through the use of absorbents, chemical reactions and freezing.

- Rinsing involves the removal of contaminants through dilution, physical attraction, and solubilization. Multiple rinses with clean solutions remove more contaminants than a single rinse with the same volume of solution. Continuous rinsing with large volumes will remove even more contaminants than multiple rinsing with a lesser total volume.

- Disinfection/Sterilization is a means of inactivating infectious agents. This method is difficult to implement in the field and therefore disposable PPE is generally recommended.

Once decontamination procedures have been established, all personnel requiring decontamination must be given precise instructions and, if necessary, practice moving through the decontamination line. Progress through the decontamination line must be deliberate, organized, and exceptionally thorough to protect the health of the team members. Decontamination station detail for various protection levels are outlined in Attachment A.

Due to the lack of an immediate test for determining the effectiveness of decontamination, the primary test of decontamination is visual. Discolorations, stains, corrosive effects, dirt, or other alterations in fabric integrity are indications that decontamination may not have been fully effective. In addition, some chemicals can permeate PPE without any visible trace. Wipe tests or analysis of the final rinse solution may be employed to determine the effectiveness of the decontamination procedure.

In the case of sample containers, care must be taken to ensure that decontamination procedures do not contaminate the contents of the sample container. In most cases, a distilled water rinse is adequate, although the SHSO must ensure that the sample contents will not react with water. If the sample is of a volatile organic compound, a photo ionization detector should be utilized to ensure proper decontamination.

All personnel should exit the EZ through the CRC. The reason for leaving the EZ determines the need and extent of decontamination. Also, the time required for personnel decontamination must be ascertained and incorporated in the scheduling of site activities.

A worker leaving the EZ to pick up or drop off tools or instruments and immediately returning may not require full decontamination. However, a worker leaving to get a new air cylinder or change a respirator would require some degree of decontamination. Personnel wearing self-contained breathing apparati must leave their work areas with sufficient air to walk to the CRC and go through decontamination. (Note: TechLaw personnel may not wear self-contained breathing apparati without special permission from the HSO.) Individuals departing the CRC at break time, lunchtime, or the end of the day must be decontaminated thoroughly.

The type of decontamination equipment, materials, and supplies are generally selected on the basis of availability. The ease of equipment decontamination and disposableness is also considered. Most equipment and supplies can be easily procured. Soft-bristle scrub brushes or long-handled brushes are used to remove contaminants. Buckets of water or garden sprayers are used for rinsing. Large galvanized wash tubs, stock tanks, or children's wading pools can also be used as containers for wash and rinse solutions. Large plastic garbage cans or similar containers lined with plastic bags are useful for the storage of contaminated clothing and equipment. Metal or plastic cans and drums are convenient for the temporary storage of contaminated liquids. Other gear includes paper or cloth towels for drying protective clothing and equipment.

Closure of CRC

When the CRC is no longer needed, it must be closed down by the operators. All disposable clothing and plastic sheeting used during the operation must be double-bagged and either contained on the site or removed to an approved off-site disposal facility. Decontamination and rinse solution could be discarded on site if approved by regulatory agencies or removed to an approved disposal facility. Reusable clothing should be dried and prepared for future use. (If gross contamination had occurred, additional decontamination of these items may be required.) Cloth items must be bagged and removed from the site for final cleaning. All wash tubs, pails, containers, etc., must be thoroughly washed, rinsed, and dried prior to removal from the site. If after a thorough decontamination, any piece of PPE shows signs of degradation, staining, or other reasons to cause doubt as to whether it has been fully decontaminated, that piece of equipment must be disposed of.

Health and Safety

It is TechLaw's policy to maintain an effective program for control of employee exposure to chemical, radiological, and physical stress which is consistent with OSHA and other applicable and appropriately established standards and requirements.

All field personnel will be provided with appropriate personal protective clothing and safety equipment. At a minimum, this will include a hardhat, hearing protection, full-face respirator, steel-toed safety shoes, and safety glasses. Personnel are required to inspect their PPE prior to entering any job site and replace any damaged items.

A site-specific health and safety checklist/plan must be developed by the SHSO and approved by the HSO or designee prior to implementation in the field. This checklist/plan must be reviewed with the field team members prior to beginning work.

Any deviation(s) from an approved site-specific health and safety checklist/plan must be documented in the field logbook.

QA/QC

None at this time.

Comments/Notes

None at this time.

Attachments

Attachment A - Contamination Reduction Zone Layout

Attachment B - Decontamination Layout - Level A Protection

Attachment C - Decontamination Layout - Level B Protection

Attachment D - Decontamination Layout - Level C Protection

References

TechLaw, Inc., Field Equipment Manufacturers' Instruction Manuals Handbook, Winter 1995.

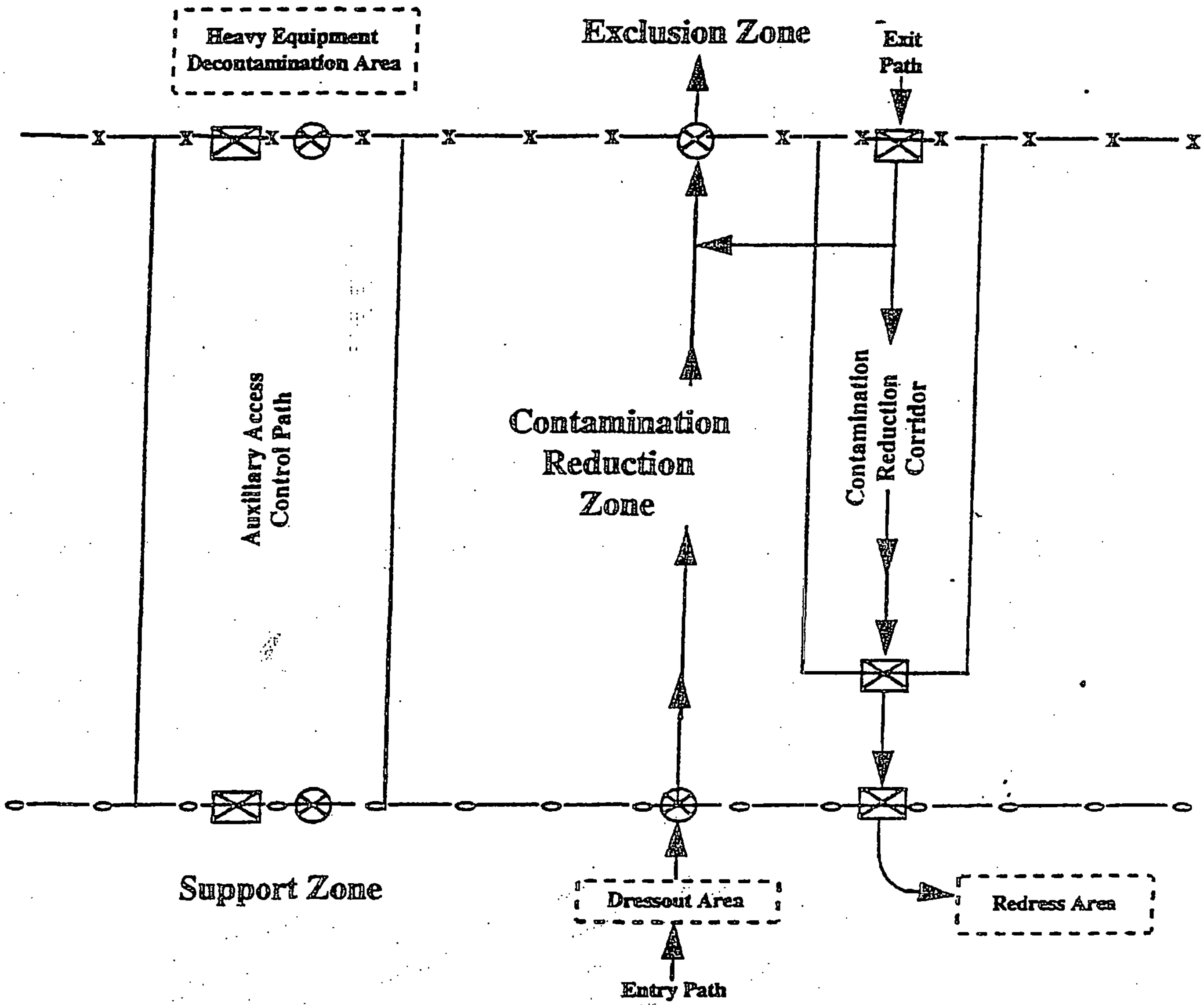
TechLaw, Inc., Health and Safety Program, 1999.

TechLaw, Inc., Health and Safety Project Plan for Field Activities, 1999.

TechLaw, Inc., Quality Assurance Program Plan (as amended for the RCRA Enforcement, Permitting, and Assistance Contract).

ISO 9000 (international quality assurance and quality management standards).

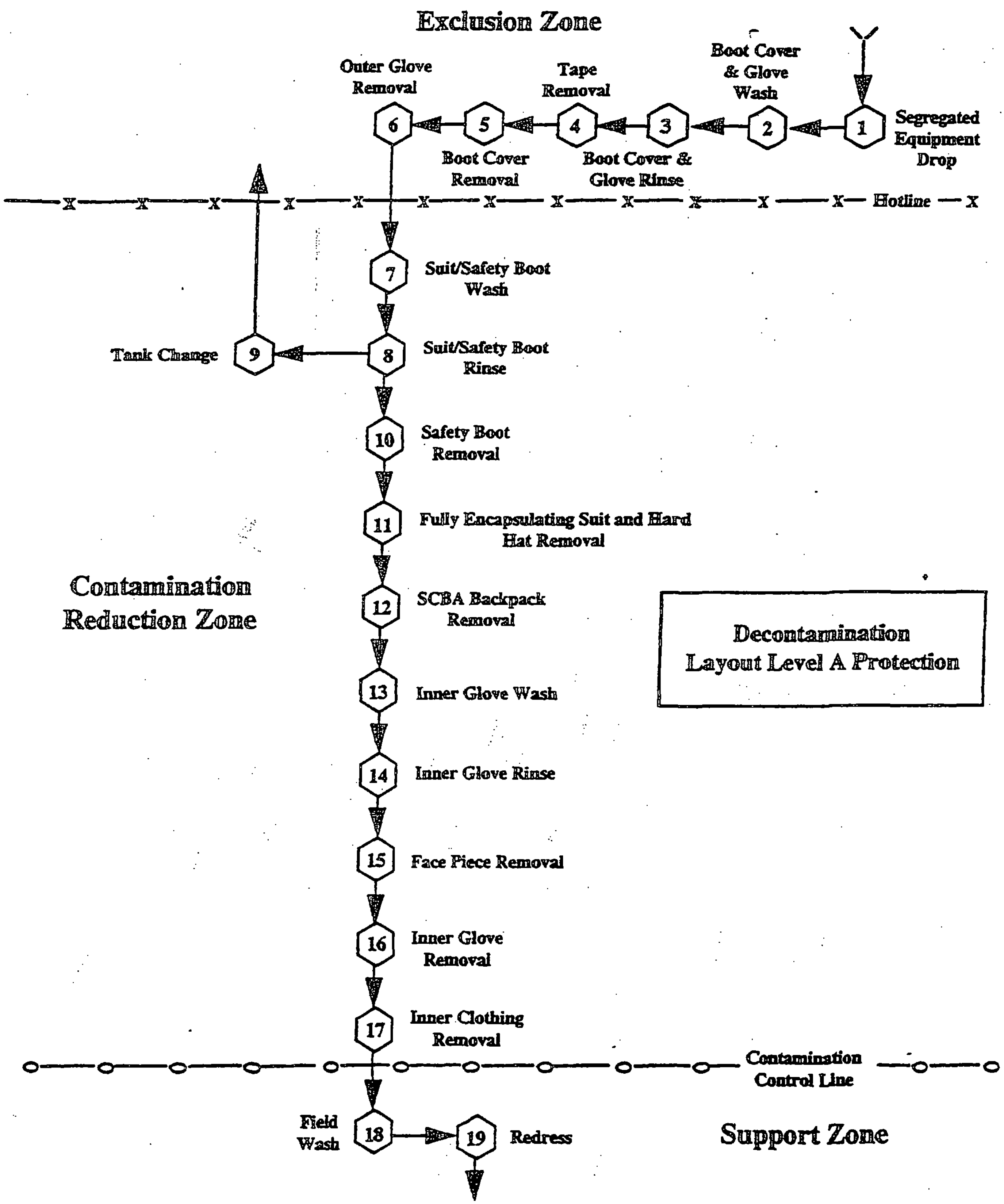
ATTACHMENT A
SOP Number: 09-08-01



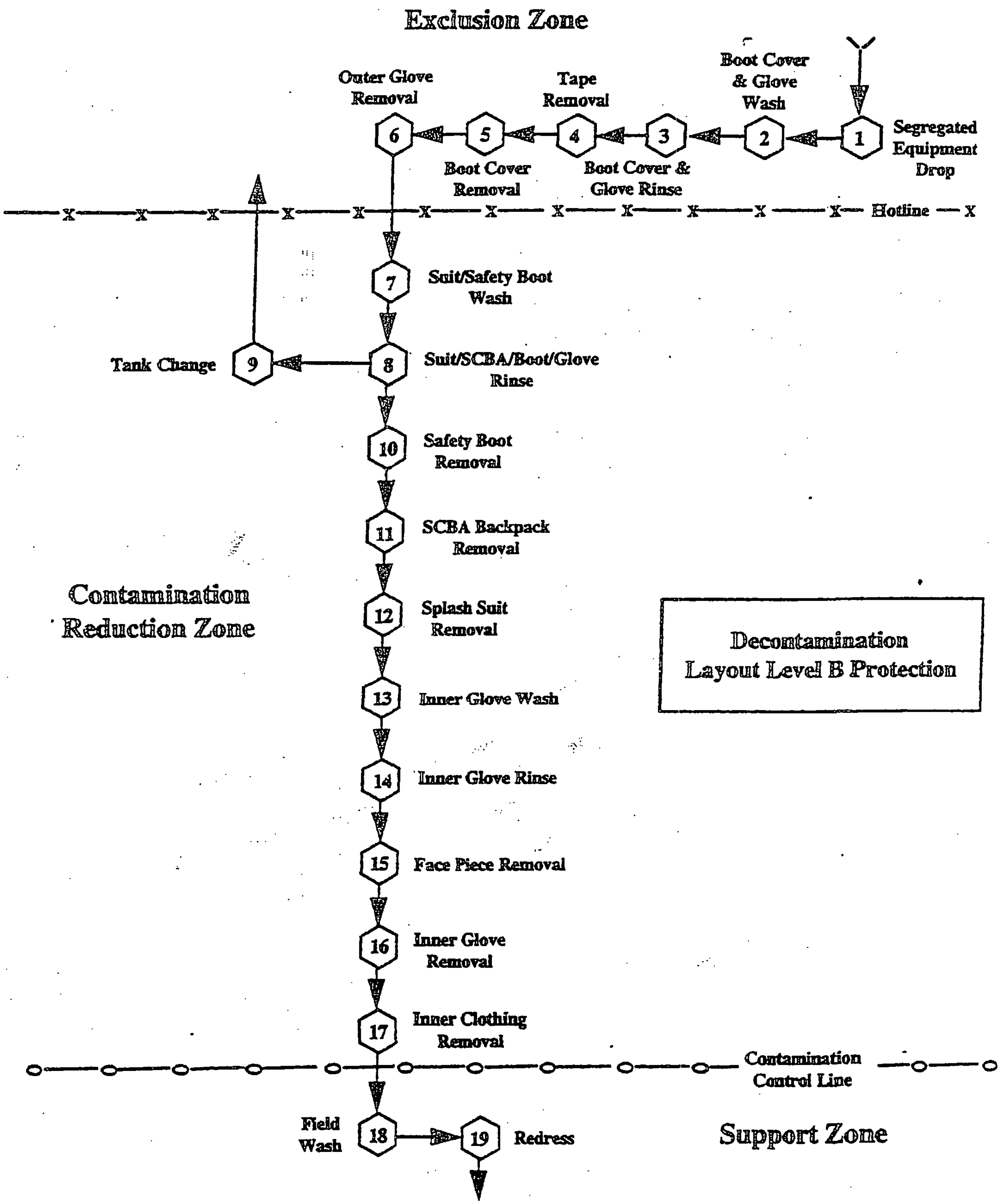
Contamination Reduction Zone Layout

Legend	
X——X O——O	Hotline Contamination Control Line
⊗	Access Control Point — Entrance
⊠	Access Control Point — Exit

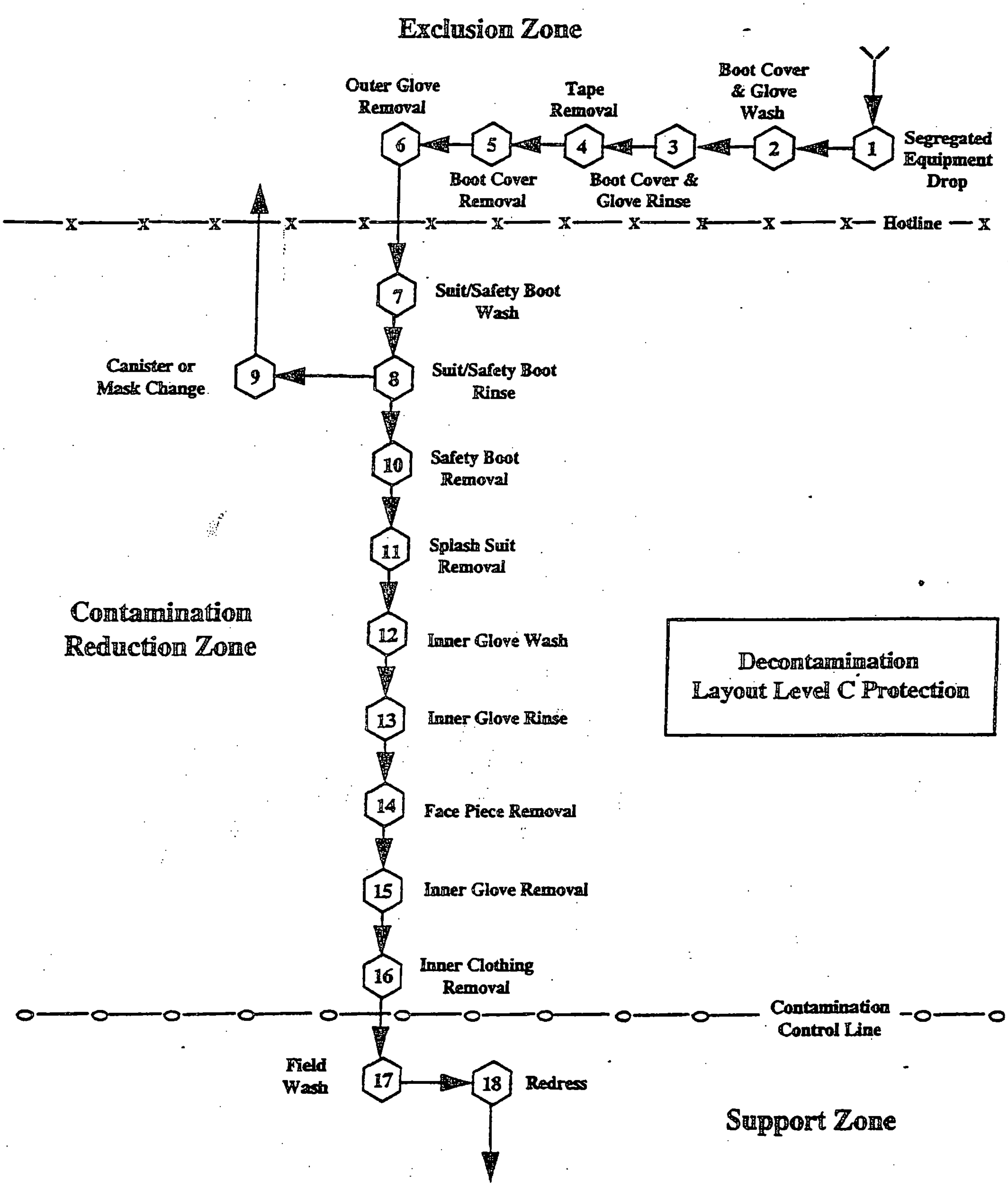
ATTACHMENT B
SOP Number: 09-08-01



ATTACHMENT C
SOP Number: 09-08-01



ATTACHMENT D
SOP Number: 09-08-01



APPENDIX E

MATERIAL SAFETY DATA SHEETS

ST. LOUIS (EX) ARMY AMMUNITION PLANT

HEALTH AND SAFETY PLAN

AUGUST 2002

Material Safety Data Sheet
Sodium Bisulfate Monohydrate

ACC# 20995

Section 1 - Chemical Product and Company Identification

MSDS Name: Sodium Bisulfate Monohydrate
Catalog Numbers: S80175, S240 3, S240 500, S240-3, S240-500, S2403, S240500
Synonyms: Sodium Hydrogen Sulfate
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
10034-88-5	Sodium Bisulfate Monohydrate	100	unlisted

Hazard Symbols: XI
Risk Phrases: 41

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colourless. **Danger!** Corrosive. Moisture sensitive. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. The toxicological properties of this material have not been fully investigated. Causes severe eye and skin irritation with possible burns.
Target Organs: Teeth, eyes.

Potential Health Effects
Eye: Causes eye burns. Risk of serious damage to eyes.
Skin: Causes skin burns.
Ingestion: May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns.
Inhalation: May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.
Chronic: Repeated exposure may cause erosion of teeth. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

Section 4 - First Aid Measures

Eyes: *Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed. Extensive* irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Do NOT use water directly on fire. Use water spray to cool fire-exposed containers. Use dry chemical to fight fire. Do NOT get water inside containers.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up *spills immediately, observing precautions in the Protective Equipment section. Avoid generating* dusty conditions. Provide ventilation. Do not get water inside containers.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Do not breathe dust, vapor, mist, or gas. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Do not ingest or inhale. Do not allow contact with water. Use only in a chemical fume hood. Discard contaminated shoes. Keep from contact with moist air and steam.
Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Store protected from moisture.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Sodium Bisulfate Monohydrate	none listed	none listed	none listed

OSHA Vacated PELs: Sodium Bisulfate Monohydrate: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Solid.
Appearance: colourless
Odor: odorless
pH: 1.4 (0.1 solution)
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not applicable.
Boiling Point: Decomposes.
Freezing/Melting Point:137.3 deg F
Autoignition Temperature: Not available.
Flash Point: Not available.
Decomposition Temperature: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Reactivity: 0
Explosion Limits, Lower: Not available.
Upper: Not available.
Solubility: 67% in water.
Specific Gravity/Density:2.103 @13C
Molecular Formula:$NaHSO_4.H_2O$
Molecular Weight:120.0544

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Incompatible materials, dust generation, excess heat, exposure to moist air or water.

Incompatibilities with Other Materials: Moisture, strong oxidizing agents, strong bases, hypochlorite.

Hazardous Decomposition Products: Oxides of sulfur.

Hazardous Polymerization: Has not been reported

Section 11 - Toxicological Information

RTECS#:
CAS# 10034-88-5: VZ1870000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 10034-88-5: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Neurotoxicity: No information available.
Mutagenicity: No information available.
Other Studies: No data available.

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.				CORROSIVE SOLID NOS (SODIUM BISULFATE)
Hazard Class:					8(9.2)
UN Number:					UN1759
Packing Group:					III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 10034-88-5 is not on the TSCA Inventory. It is a hydrate and exempt from TSCA Inventory requirements (40CFR720.3(u)(2)).

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

None of the chemicals in this material have an RQ.

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 10034-88-5: acute, reactive.

Section 313

No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 10034-88-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XI

Risk Phrases:

R 41 Risk of serious damage to eyes.

Safety Phrases:

S 24 Avoid contact with skin.
S 26 In case of contact with eyes, rinse immediately
with plenty of water and seek medical advice.

WGK (Water Danger/Protection)

CAS# 10034-88-5: No information available.

Canada

Canada

None of the chemicals in this product are listed on the DSL or NDSL list. This product has a WHMIS classification of E.
CAS# 10034-88-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

Section 16 - Additional Information

MSDS Creation Date: 9/30/1997
Revision #3 Date: 11/07/2001

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

APPENDIX F

HAZARD INFORMATION BULLETIN - LYME DISEASE

ST. LOUIS (EX) ARMY AMMUNITION PLANT

HEALTH AND SAFETY PLAN

AUGUST 2002

Hazard Information Bulletin

U.S. Department of Labor
Occupational Safety and Health Adminstration

HIB 00-4-20

LYME DISEASE

> This HIB is not a new standard or regulation, and it creates no legal obligations. It is advisory in nature, informational in content, and is intended for use by employers seeking to provide a safe and healthful workplace through an effective Lyme disease prevention program.
>
> *For a fuller description of the nature and effect of Hazard Information Bulletins, see the Important Information box on page 6.*

Purpose

This bulletin provides guidance for workers and employers about how to decrease the risk of Lyme disease in individuals who may be potentially exposed on the job to Lyme disease-causing ticks. OSHA has received inquiries on occupational exposure to Lyme disease-causing ticks for individuals who work outdoors in heavily wooded or grassy areas. These workers include those with certain construction and forestry duties as well as individuals in other occupations. The concerns are due to two events: an increase in the number of reported cases of Lyme disease since 1982 and the possible long-term health effects resulting from untreated infection. If recognized early, Lyme disease can be easily treated with antibiotic medication. However, if the disease goes unrecognized and untreated, chronic conditions may ensue, including varying degrees of permanent damage to the joints or the nervous system.[1] The Centers for Disease Control and Prevention (CDC) has published several guidelines on the prevention of Lyme disease, including avoiding or clearing tick-infested habitat; using personal protective measures, such as clothing and repellent; performing tick checks; and removing ticks early. (See CDC website at www.cdc.gov) The CDC Advisory Committee on Immunization Practices (ACIP) has also stated that Lyme disease vaccine should or may be considered for some individuals at risk. When followed, these guidelines should minimize the risk of infection and reduce the number of cases that may develop. The strategies for preventing tick bites are described by the CDC as the first line of defense against Lyme disease and other tick-borne illnesses. Preventing tick bites also prevents other tick-borne diseases, including babesiosis, ehrlichiosis, tularemia, and Rocky Mountain spotted fever.

Background

Lyme Disease is a multisystem, multistage, inflammatory illness caused by *Borrelia burgdorferi*, a corkscrew-shaped bacterium. The disease is transmitted to humans by blood-feeding ticks infected with *B. burgdorferi*. The most important vector for the spread of the disease in the northeast United States is the deer tick, *Ixodes scapularis;* on the West Coast, the western black-legged tick, *Ixodes pacificus,* is the most important vector.[2] These ticks are much smaller than common dog and cattle ticks. They can attach to any part of the human body but are especially likely to attach to the more hidden and hairy areas of the body such as the armpits, groin, and scalp.[1] *B. burgdorferi* is primarily transmitted to humans by ticks in the nymphal stage of development, but adult ticks can also transmit *B. burgdorferi*. At this stage, the tick is usually not much larger than the head of a pin and can easily go unnoticed if attached to an individual. These ticks are slow feeders. Transmission of *B. burgdorferi* from an infected tick is unlikely to occur before 36 hours of tick attachment,[3] and infected ticks are most likely to transmit infection after approximately 2 or more days of feeding.[4]

Lyme Disease currently accounts for more than 95% of all vector-borne diseases reported in the United States.[3,4] There have been more than 128,000 cases reported since 1982.[4] In 1998, the estimated incidence of Lyme disease was about 6 per 100,000 people in the U.S.; however, there may be considerable underreporting. In addition, incidence rates vary considerably from state to state and even within states and counties. In a few highly endemic counties, incidence rates exceed 100 per 100,000 people. State and local health departments can be consulted for more information regarding risk in particular areas.

The incidence and prevalence of the disease from occupational exposure has not been precisely defined. Several studies, however, have identified outdoor occupational exposure as a risk factor.[5,6] The true incidence of occupationally acquired Lyme disease is hard to define because pinpointing the exact circumstances of infection is exceedingly difficult. In fact, the majority of infected persons do not recall being bitten by a tick.

Awareness of Lyme disease and its signs and symptoms is essential for diagnosing the disease. In some cases, the diagnosis is not made because many of the signs and symptoms associated with Lyme disease are similar to those of the flu. Lyme disease often presents with a characteristic "bulls-eye" rash termed erythema migrans. This rash is seen in 60-80% of people who develop the infection; some people may have the disease without the presence of a rash.[4] In addition to this rash, other non-specific symptoms may be present, including fever, lymph node swelling, neck stiffness, generalized fatigue, headaches, migrating joint aches, or muscle aches. The diagnosis is primarily based on a history of known exposure and the development of clinical signs and symptoms. Blood testing can provide valuable supportive diagnostic information. Following a diagnosis, Lyme disease, in most cases, can be successfully treated with standard antibiotic regimens. It is very important that the infection be diagnosed and treated with appropriate antimicrobial medication as early as possible because untreated Lyme disease may result in symptoms that are severe, chronic, and disabling. These disorders include chronic inflammatory arthritis, chronic muscle pain, heart disease, and/or neurological (brain and peripheral nerves) disorders.[3,7] In addition, Lyme disease in a later stage is more difficult to diagnose, and treatment may be more prolonged and costly.

Description of the Hazard

Many activities can place an individual at risk of exposure to ticks infected with the *B. burgdorferi* bacterium. These activities can be occupational or non-occupational. Most *B. burgdorferi* infections occur after residential exposure to infected ticks during property maintenance, recreational, or leisure activity.[3] Non-occupational exposures also occur when individuals away from home participate in recreational activities such as hiking, camping, fishing, and hunting. Occupations that require outdoor activity/work in areas where the disease is endemic can place an individual at increased risk of exposure to an infected tick and therefore to Lyme disease. Occupations that may be associated with an increased risk of exposure to infected ticks include construction, landscaping, forestry, brush clearing, land surveying, farming, railroad work, oil field work, utility line work, and park/wildlife management.[1,3]

The CDC estimates that the number of annually reported cases of Lyme Disease has increased 33-fold since national surveillance began in 1982 (based on 16,801 cases in 1998 versus 497 cases in 1982). Cases of Lyme disease have been reported in 48 of the 50 states as well as the District of Columbia[4]; 25% of states include at least one area with moderate to high risk of tick infection with the *B. burgdorferi* bacterium. The states that include areas with the highest risk are those in the northeast U.S., from Massachusetts to Maryland; the north-central region including Wisconsin and Minnesota; and an area in northern California in the pacific-coastal region. There is a high prevalence of *B. burgdorferi* in the tick population in these areas and therefore an increased risk of acquiring Lyme disease from a tick bite. The remainder of the states have no or few ticks infected with *B. burgdorferi* and are considered low, minimal, or no risk for Lyme disease.

Several other factors must be considered when determining risk of exposure to *B. burgdorferi*-infected ticks. For example, an individual's daily activities should be taken into consideration. As previously mentioned, certain occupations and leisure activities are likely to put one at risk; other considerations include the frequency, duration, and season of a likely exposure. Although adult ticks also carry *B. burgdorferi* and can be a source for human infection, the majority of Lyme disease cases result from bites by infected nymphs. Ticks in the nymphal stage feed predominately in the late spring and early summer, although this season may be prolonged in some areas, depending on climatic conditions. State and local health departments are good sources of further information regarding a particular geographic area.

Prolonged, frequent exposure to infected tick habitats, especially during the season when nymphal ticks are feeding, significantly increases the risk of being bitten by ticks. Another factor for consideration is the density of vector ticks in the environment. This vector-tick density also varies with geographic location. Vector ticks are present in most of the states throughout the U.S. There are, however, some areas that are more highly populated with infected ticks (as discussed earlier), and thus individuals in these locations would be at greater risk. Finally, the prevalence of *B. burgdorferi* infection in the vector ticks must be considered. All of these conditions are important considerations in determining an individual's risk of developing Lyme disease.[3] Individuals who engage in high-risk leisure activities or occupations, especially during nymphal tick feeding season, in areas heavily infested with ticks carrying *B. burgdorferi* are at greatest risk of infection.

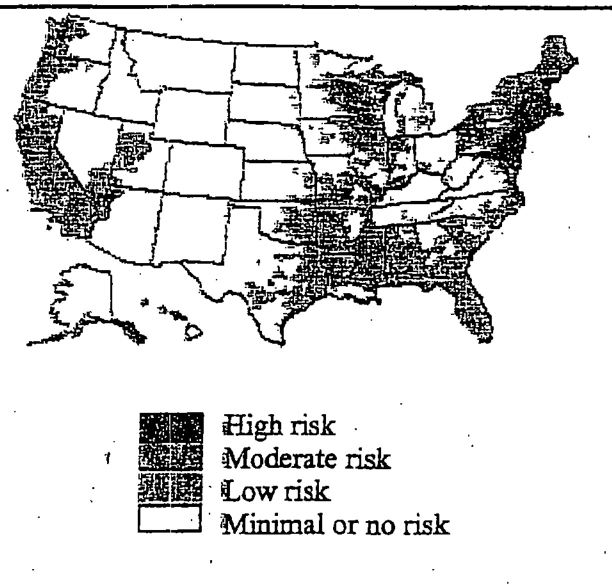
Prevention

Contact Avoidance

Avoiding tick bites is of utmost importance in the prevention of Lyme disease and other tick-borne illnesses. The CDC discusses several strategies to prevent tick-human contact:

- Avoiding brushy, overgrown grassy, and wooded habitats, particularly in spring and early summer when nymphal ticks feed[3];

National Lyme disease risk map with four categories of risk



Note: This map demonstrates an approximate distribution of predicted Lyme disease risk in the United States. The true relative risk in any given county compared with other counties might differ from that shown here and might change from year to year. See reference 1 for details on risk definition.

- Removing leaves, tall grass, and brush from areas surrounding work areas or residential areas, thereby reducing tick, deer, and rodent habitat;
- Applying tick-toxic chemicals (e.g., Damminix, Dursban, Sevin, etc.) to surrounding work or residential areas has resulted in suppression of the tick population. Pesticides should be used only in accordance with federal Environmental Protection Agency (EPA) and applicable state and local regulations. Their application may be controversial or considered inappropriate in some communities. Some concerns regarding widespread use, including long-term effects on water supply and wildlife, have been raised. Investigation into various environmental aspects of these measures continues.

Although tick habitat should be avoided or cleared where possible, there are some job duties where this is not possible. The probability of tick bites can be decreased by using personal protection. Several measures have been recommended for personal protection, and have been used, including[4,8]:

- Wearing light-colored clothing so that ticks can be more easily seen and removed before attachment occurs;
- Wearing long-sleeved shirts and tucking pant legs into socks or boots to prevent ticks from reaching the skin;
- Wearing high boots or closed shoes that cover the entire foot;
- Wearing a hat;
- Spraying insect repellents (containing n,n-diethyl-m-toluamide [DEET]) on exposed skin, excluding the face, in accordance with EPA guidelines. Using permethrin on clothes to kill ticks on contact;
- Showering, and washing and drying clothes at a high temperature, after outdoor exposure;
- Checking the body carefully for ticks; once found, promptly removing them with tweezers and cleansing the skin area with an antiseptic.

Although extensive statistical analyses of the effectiveness of these protective measures have not been accomplished, these practices are recommended by public health experts, and they are used by tick research personnel and others with unavoidable exposure to ticks. Studies have examined some of these measures and have indicated that some of them are effective.[6]

Vaccine

Although two vaccines have been developed for the prevention of Lyme disease, the U.S. Food and Drug Administration (FDA) has approved only LYMErix for use in the U.S. This approval is for use in individuals 15-70 years of age, an age range that includes most workers. The LYMErix vaccine may exert its primary action by causing the body to produce antibodies that kill the *B. burgdorferi* bacteria in the gut of the tick.[3] The vaccine requires a series of three injections for optimal protection. The second dose is given 1 month after the initial injection; the final dose is administered 12 months following the first injection. In a randomized, controlled trial (phase 3) of LYMErix, after two doses of the vaccine the protection rate against "definite" Lyme disease was 49% and after three doses was 76%.[3] Protection against asymptomatic infection was 83% after 2 doses and 100% after the third dose. The manufacturer observed no serious side effects after 20 months of study.[3] After infection with *B. burgdorferi*, however, persons who express certain MHC II molecules (a particular genetic sequence) are more likely than others to develop chronic, poorly understood Lyme arthritis associated with high levels of antibody to OspA (the primary antigenic expression of *B. burgdorferi* in the tick gut) in serum and synovial (joint) fluid.[3,9] The underlying etiology of this immune reactivity is not clearly understood,[5,10,11,12] and LYMErix contains a lipidated recombinant OspA (rOspA) protein. The vaccine should not be administered to persons with a history of treatment-resistant Lyme arthritis[3]. In clinical trials, 5,469 subjects received at least one dose of vaccine, while 5,467 subjects received at least one placebo injection. Information regarding adverse events that were believed to be related to or possibly related to injection was available from 4,999 subjects in each group. Reports of arthritis, a rare event, were not significantly different between vaccine and placebo recipients, but vaccine recipients were significantly more likely to report joint or muscle aches within 30 days following each dose. Vaccinees were significantly more likely to report redness and swelling at the injection site, muscle pain, flu-like illness, fever, and chills, although none of these was reported by more than 3.2% of subjects. For this group of vaccinees, no statistically significant differences existed in the incidence of adverse events more than 30 days after receiving a dose of vaccine. It should be noted that the rarer the event, the less likely a statistical difference will occur in a given subject population. Communications with the Vaccine Adverse Events Reporting System (VAERS) Hotline during September 1999 indicated that some reports of adverse events relating to LYMErix have been made. Long-term events associated with the Lyme disease vaccine continue to be monitored through reports to VAERS, and the vaccine manufacturer has agreed to conduct a phase 4 study to obtain long-term safety data for the Lyme disease vaccine.[13]

Lyme disease vaccine does not protect all recipients against infection with *B. burgdorferi* and offers no protection against other tick-borne diseases. Consequently, vaccinated persons, as well as the unvaccinated, should continue to practice good prevention and personal protective measures to prevent tick bites, and they should seek medical attention for early diagnosis and treatment of suspected tickborne infections. The duration of protection with LYMErix is not known,[14] although vaccine recipients continue to be monitored by the manufacturer to ascertain this information. LYMErix is not recommended for certain groups of people (see below).

The Advisory Committee on Immunization Practices has made the following recommendations regarding the LYMErix vaccine[3,4]:

- **Persons Who Work, Reside, or Recreate in Areas of *High or Moderate Risk*** (see map p.3)
  - Vaccine **should be considered** in persons aged 15-70 years who engage in activities which result in frequent or prolonged exposure to tick-infested habitat;
  - Vaccine **may be considered** in persons aged 15-70 years who are exposed to tick-infested habitat but whose exposure is neither frequent nor prolonged;
  - Vaccine is **not recommended** for persons whose exposure to tick-infested habitat is minimal or none.
- **Persons Who Work, Reside, or Recreate in Areas of *Low or No Risk***
  Vaccine is **not recommended** for persons in these areas
- Travelers to Areas of *High or Moderate Risk*
  Vaccine **should be considered** in travelers aged 15-70 years whose exposure to tick-infested habitat is frequent or prolonged. It should be noted that travelers will not achieve optimal protection unless all three doses are received, although some protection is afforded from two doses of vaccine.
- **Pregnant Women**
  Vaccine is **not recommended** for pregnant women because the safety of rOspA vaccines administered during pregnancy has not been established.
- **Persons with Immunodeficiency**
  No data available (persons with immunodeficiency were excluded from phase 3 safety and efficacy trial).
- **Persons with Musculoskeletal Disease**
  Limited data available regarding Lyme disease vaccine in persons with diseases associated with joint swelling (including rheumatoid arthritis) or diffuse musculoskeletal pain because these individuals were excluded from phase 3 safety and efficacy trials
- **Persons with Previous History of Lyme Disease**
  - Consideration of vaccine **depends on the medical course** of the previous Lyme disease infection:

    (1) Consider vaccine for persons with a history of previous uncomplicated Lyme disease who are at continued high risk.

    (2) No vaccination for persons who have treatment-resistant Lyme arthritis, because of the association between this condition and immune reactivity to OspA.

    (3) Safety and efficacy are unknown for persons with chronic joint or neurological illness related to Lyme disease because individuals with these characteristics were excluded from phase 3 safety and efficacy trials.

    (4) Safety and efficacy are unknown for persons with second-or third-degree atrioventricular block, because individuals with these disorders were excluded from phase 3 safety and efficacy trials.

Conclusions

The incidence and prevalence of occupationally acquired Lyme disease has not been precisely defined; several studies have addressed this issue and have indicated that outdoor workers in areas where the disease is endemic are at increased risk.

The risk of encountering ticks infected with *B. burgdorferi* varies from state to state, within states, and even within counties. Current information regarding risk in specific areas is best obtained from state and local public health authorities.

Preventing tick bites is of utmost importance in preventing Lyme disease and other tickborne illnesses. Tick bite prevention strategies include avoidance or clearing of tick-infested habitats and use of personal protective measures (e.g., repellents and protective clothing). Tick checks should be done regularly, and ticks should be removed promptly. Lyme disease vaccine should be considered for some outdoor workers as specified in ACIP recommendations.[3]

If an individual engaged in outdoor work in heavily wooded or brushy areas develops flu-like symptoms (fever, chills, muscle aches, joint pains, neck stiffness, headache) or a bulls-eye rash, the worker should seek medical attention even if there is no recall of a tick bite.[3] A person, including an outdoor worker, who has experienced a tick bite in a high endemic area for Lyme disease should remove the tick and seek medical attention if signs and/or symptoms of tick-borne diseases occur.[3] Medical evaluation following a tick bite in a high-endemic area for Lyme disease or other tickborne illness may help to alleviate concerns and establish a baseline for follow-up of the bitten individual should signs and symptoms develop.

Most cases of early Lyme disease can be successfully treated with commonly available antibiotics; therefore, early diagnosis and initiation of therapy are important to ensure the best treatment outcome possible.

Information Availability

Investigation continues into various aspects of Lyme disease, including more precise definition of occupational transmission, relative effectiveness of the various recommended preventive measures, and long-term epidemiological studies of the safety, efficacy, prevention effectiveness, cost effectiveness, and patterns of use of the Lyme disease vaccine. Meanwhile, workers and employers need to be aware of the present state of knowledge regarding Lyme disease and methods of protection. Workers should be advised of the signs and symptoms of Lyme disease, as well as the primary and secondary preventive measures for decreasing the risk of Lyme disease transmission, acute illness, and chronic health effects.

The ACIP Recommendations for the Use of Lyme Disease Vaccine[3] are available on the CDC web site (www.cdc.gov) and can be consulted for more information regarding Lyme disease, including protective measures and treatment considerations.

OSHA field staff and consultation personnel should be aware of the potential for Lyme disease transmission to outdoor workers in areas endemic for *B. burgdorferi* infected ticks.

Please distribute copies of this bulletin to Area Offices, State Plan States, and Consultation Projects.

Important Information on the Nature and Effect of Hazard Information Bulletins

The Directorate of Technical Support issues Hazard Information Bulletins (HIBs) in accordance with OSHA instruction CPL 2.65 to provide relevant information regarding unrecognized or misunderstood health hazards, inadequacies of materials, devices, technique, and safety engineering controls. HIBs are initiated based on information provided by the field staff, studies, reports and concerns expressed by safety and health professionals, employers and the public. Bulletins are developed based on thorough evaluation of available facts in coordination with appropriate parties. The HIB is not intended to address issues related to patient care.

An HIB is not a new standard or regulation, and it creates no legal obligations. It is advisory in nature, informational in content, and is intended for use by employers seeking to provide a safe and healthful workplace.

The *Occupational Safety and Health Act* requires employers to comply with hazard-specific safety and health standards. In addition, employers must provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm under Section 5(a)(1), the General Duty Clause of the Act. Employers can be cited for violating the General Duty Clause if there is a recognized hazard and they do not take steps to prevent or abate the hazard. However, failure to implement HIB recommendations is not, in itself, a violation of the General Duty Clause. Citations can only be based on standards, regulations, and the General Duty Clause.

References

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